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No. I.—1891.

Report on Archæological Excavations in Bijnor, N.-W. P.—*By* A. MACAULAY MARKHAM, C. S., F. R. G. S., F. Z. S.

In November 1884, His Honor Sir Alfred Lyall placed a sum of money at my disposal for the purpose of making certain archæological excavations in the Bijnor district.

I first excavated a strange looking mound of evidently great age, at Típ on the left bank of the Ganges Khádir, 15 miles N. N. E. of Bijnor. In this no relic chamber or relics of any kind were found. I have little doubt, however, that the mound was of Buddhist origin. A square doorless structure was disclosed, which I take to have been the plinth of a temple. In the light of fuller experience, I should like to take an opportunity of again examining this mound, which is not far from the border of the Muzaffarnagar district.

Six gold Indo-Scythic coins, of great beauty and rarity, were found near but outside the base of this mound. These were as follows :—

Three of Vasu Deva—Average weight 120·17 grains.
Two of ditto (differing) „ 118·87 do.
One of Bhṛi Sháka. Weight 120·0 grains.

These kings were contemporary in Northern India with the earlier Gupta kings, or say not later than A. D. 200.* The coins were, by order of Government, sent to the Curator of the Lucknow Museum.

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* [Vasu Deva reigned from about 122-176 A. D.; the Gupta rule commenced about 319 A. D. Ed.]

A

Some silver coins, of comparatively recent date, and of no archæological value, were found buried close under the surface of this mound. They were sold as silver, and the proceeds credited to the excavation fund.

I next commenced operations on a fine mound in the old ruined Fort of Mor Dhaj (*Mayúra Dhwaja*, also known formerly,* but not now apparently, as *Munavvar Júr*), lying 7 miles north-east of Najíbábád, to which I drew the attention of General Cunningham, R. E., many years ago, and which has been briefly described by him in the Archæological Reports, Volume II, page 237.

The mound was in dense jungle, and used† to be known as *Shigrí* ((Qy. *Sher-Gaṛhí*, or *Shrí-Gaṛhí ?*), but I now find that this name, like that of *Munavvar Júr*, has dropped out of local use and knowledge.

After careful clearing of the overgrowth of jungle, the mound was disclosed, 35 feet in height, and 308 feet in circumference, circular. A closer examination showed that the outer portion of the mound was composed of brick rubbish, the remains of some large superstructure. The size and importance of this building, originally, no doubt, a large Chaitya, with the usual series of umbrella-like discs composing its lofty spire, and in later days probably a temple, may be guessed at from the fact that the entire surface of the mound, to a depth of from 3 to 8 feet, and many square yards of plain surface around its base to a similar depth, were covered with broken brick debris. I am informed that, within the memory of living men, there were still portions of the superstructure standing on the mound, but that the materials were utilized in the construction or repair of bridges on the Najíbábád and Koṭdwára road, which skirts the base of the old fort, at a distance of about 400 yards. If this be true, it is a matter of very serious regret.

I first had the covering of debris very carefully removed from six foot lines on the centre of all four sides, these lines meeting at top, and being extended to the foundation, 7 feet below the present level of the soil. In this debris nothing was found of any interest. It was all composed of pieces of brick, which had mostly been of the large size usually found in these old remains. No pieces of building stone were found.

The only things of any interest found in this or in the surrounding debris were the following :

(*a*). A portion of a terra-cotta figure ; left leg from groin to ankle, 7½ inches ; right thigh (only) 4½ inches. Wearing a tight *dhotí*, with an ornament over the seat of the genital organ. (This ornament differs from that in Fig. 4, Pl. XIX, Prinsep's Thomas' Indian Antiquities). The figure was in very high relief on a brick slab, and there are traces of drapery or other carving on the slab between the legs. Found in debris of well 60 yards north-east.

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* Within the last 20 years.

† Within 20 years back.

(*b*). A small *headless* figure (terra-cotta) probably of Buddha the Teacher, seated cross-legged, with soles of feet upturned; with the elbows on the thighs, and the hands (broken) raised in front of the body. The fingers were originally no doubt in contact, right index on left, in the attitude of demonstration. The figure is seated on a lotus ornamented couch, supported on the heads of two couchant antelopes. As the antelope was the totem or cognizance of Santánáth, the 16th Jain hierarch, the statuette *may* be his, but I take it to be a Buddha.

Total original length of figure about 4½ inches. Present total length of fragment of figure, seat and supporters, 6 inches. This was also found in the debris near the well, not on the mound.

(*c*). Head, neck and shoulders of a small sandstone figure, probably female. The hair arranged in a highly ornamental manner in a double roll. Features undistinguishable. This figure has evidently been broken off a larger work, of which no portions were found. No other pieces of this stone were found.

(*d*). A portion of apparently the lintel of a door. It is of very heavy black basalt. It represents a figure seated on its hams, with the legs partly crossed, with a club (?) held upright in each hand, the base of the club resting on the thigh of the figure. This figure is within a Chaitya.

On each side of the Chaitya are what appear to be issuant demons or elephants. Sculpture of the rudest. There is an indication of a trunk and large ears, so that the figure may have been meant for Gaṇeśa; but the position is against that, and there is no sign of the usual rat. Features of figure gone. No other portions of this series, nor of any figures in this stone were found. Height of Chaitya 7 inches. Interior of Chaitya, 3 × 2½ inches. This was found *within* the old well, in the accumulated rubbish which filled it.

(*e*). A conical implement of stone. Either a hammer or a rice-husker. It is marked with a series of indented sockets all round the thick end, which would seem to have been intended to give the fingers a purchase or grip of the implement when in use. The lower end is much chipped. Extreme length 5½ inches; extreme breadth 3¼ inches.

(*f*). A small brick fragment from a canopy of a figure. Debris of main mound.

(*g*). A mason's plumb weight of burnt earth, shaped like some in use to-day, with a hole in the centre of the top in which to fasten the cord. In the debris in the old well.

The core of the mound, that is to say, the original stúpa was revealed by the clearing away of the debris from the above lines, and proved to be conical in general elevation, with a truncated top; the superficies being found to be in a series of deep steps all round, the bottom step, *i. e.*, the plinth, being much wider on top than the others, thus forming the usual ceremonial promenade (*parikarma*) surrounding the *stúpa*. The foundation of the structure is 7 feet below present ground level, but the latter is, to the depth of at least an average of 3 feet, composed of debris. There was no trace of a railing, nor were any pieces of a railing found. The surrounding earth might repay digging.

I then commenced to sink a shaft down the exact centre of the *stúpa*. Two and a half feet below the platform-like top, the relic chamber was found. It was completely full of terra-cotta objects, in loose mould, huddled in without care or arrangement, and much broken, thus showing, I think, that the chamber had already been opened, and no doubt rifled of its casket and of anything supposed to be valuable.

These terra-cotta objects found in the relic chamber, consisted of the following :—

First. At least one thousand small tablets $3'' \times 2,''$ from $\frac{5}{8}''$ to $\frac{7}{8}''$ thick at the base, and from $\frac{3}{8}''$ to $\frac{5}{8}''$ at top. They are all stamped from the same die, or cast in the same mould, and bear a seated figure similar to those of Buddha the Ascetic, in the usual position of meditation, with the feet impossibly folded, soles uppermost, and the hands joined in the lap, palms upwards, the right hand being on top. The figure is, however, *naked*, and Buddha is seldom so represented. It is seated upon an ornamented circular pedestal, and is in *mezzo relievo.* The hair is arranged in a knot on the top of the head, and from that knot appears to rise a high plume-like ornament with a spreading top, possibly representing peacocks' feathers. This might, however, be intended to represent the top of the ornamental back of the seat, but I take it to be a head ornament. There is a halo or 'glory' round the head. There are two diminutive naked male figures as supporters, one on either side; holding in their inward hands (*i. e.*, one in the right hand and the other in the left) objects which may be wands of office or long bows. These tablets bear no inscription. There is nothing on the reverse. They were no doubt votive tablets. Several hundreds of these tablets were broken to pieces. Each tablet was separate, and none were enclosed in clay or in model stúpas. A collection has been deposited in the Lucknow Museum, two were submitted to the Government N. W. P., and about six hundred have been left with my successor in Bijnor.

As far as I can discover, no such tablets have been hitherto found anywhere else. In his description of Sárnáth, (Archæological Reports, Volume I, page 119), General Cunningham says incidentally that he has seen in Burma accumulated heaps of small burnt clay figures of Buddha, but he does not describe them. If those were not similar to these now discovered by me, then my find is, I believe, unique. There is no other mention of any similar figures in the entire series of the Archæological Reports. The figures *may*, however, represent some Jain patriarch, but I doubt it, from the immense number of them, and their being evidently in a relic chamber.

Secondly. Two large circular terra-cotta medals, both from the same die; 3¾ inches in outside diameter. Having been less thoroughly baked than the tablets, these medals were much broken, the more beautiful of the two being unfortunately badly shattered.

These handsome medals are quite unique. Somewhat similar representations are said to be depicted on the Bharhut stones, now in the Indian Museum, (*vide* General Cunningham's *Bharhut Stúpa*, Pl. XIII, which, however, is not at my hand for reference). Also see Prinsep's (Thomas') Indian Antiquities, Fig. 1, Pl. XIX, where is figured a portion of a clay medal found at Bihat. Pakna Bihar (Archæological Reports, Vol. XI, p. 31, Pl. XII.), S'ravastí (*ibid.*, p. 89, Pl. XXVIII), Dharáwat (*ibid.*, Vol. XVI, p. 45, Pl. XIII), and Kusinagara (*ibid.*, Vol. XVIII, p. 70) are, as well as I can discover the only places where terra-cotta seals have been found. None of the seals found at the first three places are similar to, or of such fine execution as mine; and unless some of the Kusinagara seals were similar, which apparently was not the case, or they would certainly have been described, those now found by me are the first of their kind.

Mr. Carlleyle gave no plate of his (Kusinagara) seals, but a very meagre description of some only; a description which does not represent either of the Mayúra Dhwaja seals. Lac seals have been found in many stúpas, but none bearing an impress like these.

The following is a description of these beautiful medals. In the centre is Buddha the Ascetic seated in the usual attitude save that there is an appearance of something on his right, which may, however, be an effect of the earth which was adherent to the seal There is a halo round his head, and the semblance of a necklace, which may possibly be the edge of the mantle, leaving the right shoulder bare. Buddha is seated within a handsome Chaitya with a lofty pinnacle of the diminishing umbrella type, decorated with streaming garlands. On either side of the pinnacle are flying human figures, with perhaps drums or other musical instruments. These flying figures are said by General

Cunningham (Arch. Report, I, 263) to be the usual accompaniments of the Ascetic Buddha. On either side of the body of the Chaitya stands a male figure as a supporter.

These wear the *dhotí*, and one a necklace. Their hair is dressed high, each in a different style, and there is a halo or 'glory' round the head of each. (Possibly the figure on the proper left, wearing the necklace, is a woman ?) Each would seem to carry a *chaumrí* in the outer hand, and at least one, if not both, a bow or wand of office in the inner. (There is an indication that the line forming this implement near the figure on the proper left is part of an oval ornamental ring round the Chaitya.) It is impossible to say clearly what this figure has in his right hand. There are also some matters unintelligibly depicted alongside of each figure, especially to the left of the left hand supporter. There are two marks on either side of the Chaitya which look like conventional palm trees.

It will be noted that on the tablets Buddha is large, while the supporters are diminutive. Here Buddha is small and the supporters gigantic. Underneath the base of the Chaitya is the Buddhist creed, of the usual formula "*Ye Dharmmá hetuprabhavá &c.*" Under the inscription is a strange figure, apparently a woman, kneeling, with uplifted adoring hands, before what looks like a pan with handles set upon a *chúla*. This figure may be that of the Bhikshuṇí *Utpalá* or *Utpalavarṇá*, who was the first person to see Buddha after his return to earth at Sankisa from his visit to his mother in the Trayastriṃśa heavens; (Cunningham, Archæological Report, XI, p. 26) or it may represent something of the nature of the Burmese *shiko*. (See Cunningham, regarding some kneeling figures, somewhat analogous; Arch. Report, Vol. I, p. 9.) On the reverse of that one of these two large medals which was photographed is a rude delineation of the Bo tree, cut after the stamping of the medal. This is not on the duplicate medal. The least broken of the two large medals, and six copies of the photograph of both sizes of medal by Col. Waterhouse were submitted to the Government N.-W. P.* The finest but most broken medal is in the Lucknow Museum.

Thirdly. About two dozen smaller terra-cotta medals. Several of these were broken to pieces. The clearest one has been photographed. They contain a panel with a seated ascetic Buddha, having two attendants on each side. The panel is surmounted by a miniature stúpa in the centre, with a still smaller one on either side of it. The panel and stúpas are surrounded by a wreath of bells. Underneath the panel is the Buddhist creed, as above. Specimens of this medal have been deposited in the Lucknow Museum.

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* [This photograph, together with a description of the medals, was published in the Proceedings of the Society, for April 1887. Ed.]

Fourthly. One copper *salai* or instrument for applying antimony to the eyes, similar to those found in the Bihat excavations (*vide* Prinsep's (Thomas') Indian Antiquities, Fig. 18, Pl IV.)

Judging from the type of character used in the inscriptions on these medals, the stamp was probably of the 8th, or at latest of the 9th century of the Christian era. The date of the building of the stúpa cannot therefore be earlier than A. D. 700.

The excavating shaft was carefully continued down to the foundations, but nothing else was found. The entire mound consists of an uniform mass of solid brick work. The bricks are chiefly of large size (14 × 8 × 2¼), laid in mud. They are all well-burnt, some being very hard. Small galleries, driven in at about present ground level, or a little lower, and at the cardinal points, might yield something. The shaft ought to be thatched over before the rains, or it will fill with water, and the mound will be much injured thereby.

The old fort of Mordhaj (Mayúra Dhwaja), if it were built by the king of that name, would date from about the beginning of the 10th century of our era. A Mayúra Dhwaja reigned in Gauḍa (Gonda), a portion of the ancient realm of Ayodhya, in 900 A. D. (Archæological Report, I, 329. But see Vol. XVII, 98, where General Cunningham may be understood as placing Mayúra Dhwaja and his brethren in the 8th century A. D.). Mr. Carlleyle, not a very trustworthy authority, however, (Archæological Report, VI, 233) has a Mora Dhwaj flourishing anywhere between 50 and 210 B. C.; while the popular tradition, which makes him contemporary with the Paṇḍus, would relegate him at least to the 14th century before Christ! We may assume, I think, that the fort was not built before the beginning of the 10th century. If so, and if I am correct in referring the characters on the seals to the 8th or at latest the 9th century, (and I think that the former is more likely,) then, of course, the stúpa which I have excavated is much older than the ruined fort which surrounds it.

The whole country round the fort, for several square miles, is covered with almost uninterrupted traces of ancient ruins, chiefly composed of pieces of the large bricks of the builders of those days. All cuttings in the course of the work of widening the Najíbábád and Koṭdwára road, about to be taken in hand, should be carefully carried out, and well watched, where they pass through these ruins. The place must have been the site of a large and wealthy city. It may have been one of those many in this neighbourhood which perished in the exterminations of the ruthless Tímúr, at the close of the 14th century. There are many such brick ruins in the Bijnor district, some of them, and the most extensive, in the middle of dense forest; their very names vanished from memory long ages ago. All these remains would I think repay excavation. I grieve that I never had leisure to take it up.

The Coins of the Chaghatái Mughals.—*By* E. E. OLIVER.

(*With four plates.*)

In the January number of the of the Royal Asiatic Society's Journal for the past year, I endeavoured to give a short geographical sketch of the Chaghatái Khánate, and a historical outline of the rulers of this, the most obscure branch, of the great house of Chengiz. A branch which nevertheless ruled over a vast extent of country, from Dzungaria, on the Chinese frontier, to Afghánistán; had its eastern capital at Almálik, the modern Kuldja, north of the Thian Shan mountains; and its western at Bukhárá in Máwará-un-Nahr. Of this line Mr. Poole, in the VIth Volume of the British Museum Catalogue of Oriental coins, says the national collection possesses but three coins, struck by Danishmandjeh and Búyán Qulí: and I therefore propose in the following list, to bring together all the numismatic evidence I have been able to obtain through the kindness of friends, who have so generously placed their coins at my disposal. I would take this opportunity to tender my best thanks to them, and also to point out that at present there is no dynastic list of rulers that can be considered accurate or complete, either in regard to the names of the Kháns, the extent of their appanages, or the length of their reigns, and that an extensive comparison of their monetary records affords one of the most hopeful means of obtaining further evidence. Every well verified name, date and mint that either private individual or public society can publish may prove a useful contribution towards the compilation of any history.

With the exception of Akhur all the mints noted in the present series are towns within the western division of the empire, Bukhárá, Samrqand, Kash, Soghd, Utrár, Tarmaz, and Badakhshán. What coinage may have issued from the eastern mints would probably be more likely to find its way to China than to India. On almost every coin the characteristic mark of the dynasty ♀, a Tibetan 'Chh' turned upside down, occupies a prominent position. This on half a dozen of Khalils and Qazáns [Nos. 12 to 17] is replaced by one of a slightly varying character ☿, the lower half of which is a noticeable mark on the coinage of the Kháns of the Qrim, also descendants of Chengiz.

The signification of this characteristic Chaghatái mark is a question of interest. According to the chronicle of Ssanang Setzen, who, himself a prince of a leading tribe, wrote a history of the "Eastern Mongols" in 1662, which is accepted as a high authority, the royal house originally sprung from that of Tibet: and Howorth in his history refers to a terminating Tibetan syllable written "*k'ri*" pronounced "*thi*," which means "throne," and is found in all the names of the ancient kings and princes of Thibet. Possibly Tibetan scholars may be able to throw some light on the ♈ "chh" in connection with the house of Chaghatái.

Most of the rulers describe themselves on their coins as "Kháqán", probably as not recognizing the sovereignty of the supreme Qááns of the line of Oktai, and several affix the name or title of "*Tímúr*," as Yasún, Khalíl, Qazán, and in the lists Tuká, Duá, and Tughlaq, though on the first three coins, noted as struck at Bukhárá, neither word is used. The following list, taken from my paper in the R. A. S. Journal, is the best approximation I can offer of the line of Chaghatái Kháns, but it is very possible that some readers of this Journal may be able to supply from coins in their cabinets some additional means of verification and check. I need hardly say I shall be greatly obliged for any such information.

A. H. A. D.		
624—1227	I.	Chaghatái.
639—1242	II.	Qará Hulákú.
645—1247	III.	Yassu Mangu.
650—1252		Qará Hulákú, restored.
650—1252	IV.	Organah (Khátún) spent the 10 years of her reign probably at Almálik.
659—1261	V.	Alghu.
C. $66\frac{4}{5}$—$126\frac{5}{6}$	VI.	Mubárak Sháh, driven from the throne the same year as nominated.
C. $66\frac{4}{5}$—$126\frac{5}{6}$	VII.	Borák.
668—1270	VIII.	Nikpai } both nominated and killed within 3 or 4 years.
670—1272	IX.	Tuká }
C. 672—1274	X.	Duá.
706—1306	XI.	Kunjuk.
708—1308	XII.	Taliku, reigned but a few months.
709—1309	XIII.	Kabák.
709—1309	XIV.	Issenbuka, appears to figure under several names.
C. 718—1318		Kabák restored.

726—1325	XV.	Ilchikdai.
726—1325	XVI.	Tarmáshirín.
$73\frac{0}{4}$—$133\frac{0}{4}$		Sanjar (? jointly or when Tarmáshirín was in India).
734—1334	XVII.	Jinkshí.
739—1338	XVIII.	Yasún.
C. 741—1340	XIX.	'Alí Sulṭán.
,, 742—1341	XX.	Buzun.
,, $74\frac{3}{4}$—$134\frac{2}{3}$	XXI.	Khalíl.
,, $74\frac{4}{5}$—$134\frac{3}{4}$	(? XXII.	Muḥammad Pulád, a doubtful prince.)
,, 745—1344	XXIII.	Qazán.
747—1346	XXIV.	Danishmandjeh.
749—1348	XXV.	Búyán Qulí.
760—1359	XXVI.	Tímúr Sháh.
		(?) Buáyán.
761—1360	XXVII.	Tughlaq Tímúr (nominal).
765—1363	XXVIII.	Ilyás Khwája.
767—1365	XXIX.	'Ádil Khán.
767—1365	XXX.	Kábul Sháh.

771—1369	Suyurghatmish.	nominal, under Tímúr.
790—1388	Maḥmúd.	

LIST OF COINS OBSERVED.*

QARÁ HULÁKÚ, son of Mutahkan. Mutukan of the lists and grandson of Chaghatái. According to Shaw اوغلى means a male child in Eastern Turkistan.

Baldah Bukhárá, xx1 H. Fræhn's Recensio.

...سد... م بيلدة بخا ... حدي ...   قرا هالاكو موته كن اوغلى

ÁLGHÚ. Algu of the lists, son of Baider and also grandson of Chaghtái.

Bukhárá, 660 H. Fræhn's Recensio.

ضرب هذا الدرهم بالبلدة ال.. سنة ستين و ستمائة   سكه | بخارا
الفاخرة   (الفاخرة)   (الغو بايدار اوغلي)

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* In the above list, besides private collections, I have referred to Fræhn's Recensio, the British Museum Catalogue, and M. Tiesenhausen's notice of M. le Count Stronganoff's collections.

No. 1. Æ. 1·55. Bukhárá, 660 H. Mr. L. White King.

In centre سکه | بخارا

Both margins alike ضرب...۔ذا الدرهم بالبلدة الفاخرة سنه ستین و ستمائة

KABA'K. The Guebek of D' Ohsson. The mint Madinatu-l-rijál (the city of the people) Tarmaz is the Tirmid of the maps north of the Oxus.

No. 2. Æ. 1·10; 119·5 grains. Madínatu-l-rijál Tarmaz. My cabinet

لااله الا... | محمد رسـ... | الله سکـ..
| مدینه الرجال | ترمذ
... | ... | عثمان | ...

[عرامسد] | اعظم مالک | م کباک
خان | ...الله ملکه

No. 3. Æ. 1·3; 119 grains. Bukhárá, 71x H. My cabinet.

بخارا | الملك لله | سکه | ... مدارالضرب
... | ...... | ...... | عشرو | سبعمائة

کباك خان | الخاقان العادل
| سـ...φ عدله | ......

No. 4. Æ. ·8; 19 grains. Bukhárá, 722 H. Mr. Rodgers.

کباک | الخاقان | العادل | خان

سکه | بخاφرا | ۷۲۲

Ditto. ·75, 20 grains. Bukhárá, 723, 725 H. My cabinet.

Ditto. Ditto; 722, 723, 724, 725 H. Count Stronganoff.

Ditto. Samrqand, 725 H. Ditto.

No. 5. Æ. ·8; 29 grains. Madí [nat] Tarmaz, 71x H. My cabinet.

الله | لااله الا | محمد رسول | الله
.........عشـ... سبعـ...

سکه | مد.. | ترمذ
...... [دبعه] ...

TARMA'SHI'RI'N.*

No. 6. Æ. ·75; 18 to 22 grains. Utrár, 733 and 734 H. Mr. L. White King.

لااله الاا | لله وحده لا | شریک
له ملکه | اترار ۷۳۳

علا الدین | ترما شیرین | خان
φ خلد | الله ملکه

Ditto. Æ. ·8. Madínatu-l-rijál Tarmaz. Count Stronganoff.

...الملک | لااله الا | ...لا شریک | ...الله

سکه مدینه الرجال ترمذ

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* Regarding mint Utrár see J. R. A. S., Vol. XX, Part I, page 86.

Ditto. Æ. Samrqand, 726 H.	Ditto.
لابهارة | ...... | الا بالعدل	سكة | سمر ♈ قند | ٧٢٦

SANJAR.

No. 7. Æ. 1·15; 116 grains. Samrqand, 731 and 732 H. My cabinet.

الله	
لااﻟـــه الا الله | محمد رسول الله |	سنجر خان | ساسد...ن بن
صلى عليه و سلم	•| ضرب في ايام دولة السلطان
ضرب سكة سمر | قند	| العادل علا الدنيا والدين
في ♈ سنة | ٧٣١.	| خلد الله ملكه

JANKSHI.

No. 8. Æ. ·7; 19 grains. Balahdah-Utrár, xx6. My cabinet.

جنكشي | خاقان عا | ...ل زيد | عدله...	سكه | ...لده ♈ اترار | سنه ست | مان...

Ditto. Utrár, 736, 737, 739 H Count Stronganoff.

Ditto. Bald Utrár 73x.	Ditto.
السلطان | الاعظم | خلد الله | ملكه	سكه | بلد ♈ اترار | سنه ٣ | ٧

YASUN.

No. 9. Æ. 1·2; 120·5 grains. Madínatu-l-rijál Tarmaz. My cabinet.

... | ... ♈ الرجال | ...مذ	...طان | يسون تيمور | الخاقان الا | ...ملكه

Ditto. Æ 1·2, 122·5 grains.	Ditto. Mrs. Stoker.
سك..يد... | الرجال ♈	...ون تيمو... | ...قان العا |
ترم... |	...خلد... | ملكه

No. 10. Æ. 1·05; 123·5 grains.	Ditto. Mrs. Stoker.
لااله الا الله | محمد رسول | الله سكه	...ن ...مور | الخاقان الاعظم | بهادر خان
| ترمذ مدينة الرجال	خلد | الله ملكه | ... ♈ عد...
ابوبكر | ...... | ...... | ...سلے	

No. 11. Æ. 1·1; 114 grains. [Samr]qand, 740 H. Mr. L. White King.

لا اله الا الله | محمد رسو... | سكه	يسون تمر خان | الخاقان العادل
سمر... | قند في سـ ... | ٧٤٥	| ...عظم خلد | ...ملكه

KHALÍL.

No. 12. Æ. 1·25; 119 grains. [Samr]qand, 74x H. My cabinet.

لااله ا... | محمد ر... | ل اللـــ... | سـ...
ابو ... | ...... | ...... | عــلے

...شه | ...ن خليل قند | ... ان ⚚
العادل...خل... [ملكه] سنه... | ... ٧۴

No. 13. Æ. 1·15; 121 grains. Bukhárá, 744 H. Mrs. Stoker.

لااله... | الله محمد | رسول الله |
سنه ٧۴۴ | .. بكر | ...مر | ...

بخارا | ...قان الاعظم | سلطان خليل
الله | خلد ♀ ملكه

No. 14. Æ. 1·15; 123.5 grains. Bukhárá, 744 H. Mr. L. White King.

لااله الا | الله محمد | رسول الله |
ابوبكر | ... | ... | عـــلے
... | الثا | ربع | سنه | ...... |
...... | ...... | ......

السلطان العادل | خليل تيمور | ...
♀ | سكه | ... | ... | بخارا
٧۴۴ | فى الثا... | ...... | ...... |
...... | ...... | ...... | سبعمائة

QAZÁN.

No. 15. Æ. 1·2; 116 grains. Bald-i-Badakhshán, 747 H. My cabinet.

سكه | دارالضرب... | بلد بد ⚚ خشان
| في سنه | ٧۴٧

قزان | في ايام دولة | الخاقان الاعظم
| سلطان خلد | الله ملك

Ditto. Æ. 1·15, 123 grains. ditto. Without date. Mrs. Stoker.

No. 16. Æ. 1·20; 123 grains. Bukhárá, 746 H. Mr. L. White King.

لااله الا الله | محمد | رسو...
| ضرب بخارا | سنه ٧۴۶
ابوبكر | عمر | ... | على

الرحمن | المظفر على اعدائي | .. لسلطان
العادل ابوالمظفر | .ازان ⚚ سلطان | لله ملكه
...... | ست و | اربعين | ......

No. 17. Æ. 1·25; 118 grains. Bukhárá, 744 H. My cabinet.

لااله الا الله | محمد | ...ل الله |
ابوبكر | عمر | ...... | علي
سكه | بخارا | سنه | ...... | ......
| ...... | سبعمائة | ۴۴

السلطان... | قازان تيمور خان |
خلد الله ⚚ ملكه
سكه | بخارا | بخارا | بخارا
٧۴۴ | ...... | ...... | ...... | سنه |
اربع | و اربعين | سبعمائة

DÁNISHMANDJEH.

Æ. 1·25, 115; grains. Bukhárá, 747 H. British Museum.

لااله الاالله | محمد | رسول الله
ابوبكر | عمر | عثمان | على

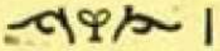
خاقان العادل دانشمند | ـا خلد الله ملكه
| سبع ♈ سبعمائة سنه اربعين | بخارا

BUYAN QULI.

No. 18. Æ. 1·2; 111 grains. Akhúr, x57 H. My cabinet.

٥٧ السلطان | الاعظم خاقان المعظم | ابوالمظفر	و الله الغني | و انتم الفقرا | لااله
خان | بو .... خلد | الله	| ...الله | محمد رسول الله
ملكه سكه...ب | اخور	...... | عمر | ...ا .. | علي
لااله الا هوالعزيز الحكيم...له.....	

No. 19. Æ. 1·2; 119·5 grains. Samrqand. Mr. Rodgers.

السلطان العا | دل بويان قلي | خلد الله ملكه	لااله الا الله | محمد | رسول الله
| 	| ضرب | سمرقند
	ابوبكر | عمـ... | عثمان | علي

No. 20. Æ. 1·25; 118 grains. Samrqand, 7xx. Dr. Stulpnagel.

الملک لله | العدل الملكبوا |	لااله الاالله | محمد | رسول الله | سكه—
الخاقان ♀ العادل | بويان قلي خان	سمرقند | صلى | عليه | رمضان | في سنه
| خلد ملكه	| .. . | .... | سبعمائة

No. 21. Æ. 1·55; 116 grains. Samrqand, 755·4 H. My cabinet.

السلطانالعا | دل بويان قلي | خلد	لااله الا الله محمد | رسول
الله...لكه * خان * |	الله | سكه | سمرقند
| سنه خمس و خمسين | سبعمائة	في | سنه | [احد] ... |
	...... | ...... | ......

No. 22. Æ. 1·25; 120 grains. Samrqand, 754 H. My cabinet.

السلطان الاعظم | بويان... ♀ خان	لااله...الاالله | محمد | رسول الله |
| ... | ملكه | ...... | سمرقند	ابوبكر ... | عمر | عثمان | علي ...... | في
	شهو ... | سنه | اربع | و خمس | وسبعمائه

No. 22 A. Æ. 1·2; 122 grains. Samrqand, 7x5 H. My cabinet.

الرحمن | المظفر على اعداي | السلطان
العادل | بويان قلي خان زيد عدّه | ♀
...... | ...... | ...خمس | ......
| ...... | سبعمائة

No. 23. Æ. 1·25; 15 grains. Samrqand, 755 H. My cabinet.

السلطان العادل | بويان قلي ♀	لااله الاالله | محمد | رسول
خان | خلد الله ملكه	الله | سنه | ٧٥٥
في شهور | ...... | خمس	سكه | سمرقند... | ابوبكر
و خمسين و سبعمائة	عمر | ......

No. 24. Æ. 1·2; 124 grains. Utrár, 752 H. My cabinet.

العادل | بویان قلي خان | خلد الله ملكه | ♀
...... | اترار | ٧٥٢ | ......

No. 25. Æ. 1·25; 118 grains. Utrár. My cabinet.

......حفظهما و هو العلي......

الخاقان العادل | الاعظم بویان قاي
| خلد الله ملكه | ... | اترار |
......سموات و ما فی الارض......

Ditto. Samr-Utrár. My cabinet.

سكه | اترار

ا قان العادل | الاعظم بویان | خلد الله
ملكه | سكه سمر اترار | زيد عمر
...... | ...... | عمر | علي

No. 26. Æ. 1·25; 122 grains. Bukhárá, 756 H. My cabinet.

لا | الله | الا | ... | محمد |
رسو | ل الله | بخارا | ٧٥٦
ابوبكر | عمر | ...... | ......

...سلطان العادل | ... ان قاي خان خل... |
له ملكه ♀ و زيد | الله عمره سكه | بخارا

No. 27. Æ. 1·25; 123 grains. Bukhárá. My cabinet.

ضرب—بخارا

لسلطان العادل | بویان قلي خان | خلد الله
♀ ملكه | سكه | بخارا

No. 28. Æ. 1·25; 122 grains. Kash, 753—4 H. My cabinet.

٧٥٣ | سكه كش

السلطان العا | دل بویان قلي | خلد الله
ملكه...
في شهور | ...... | ...... | ♀١ـــ

No. 29. Æ. 1·25; 126 grains. Kash. My cabinet.

سكه | كش..

السا | بویان قلي بها...خا... | خلد
الله ملكه | ... | ♀

Ditto. Soghd. Count Stronganoff.

| سكه صغد

خان | الخاقان | العد ... | العادل
| بویان... | خلد ♀ الله

BUAYAN. ? Seldúz. After Búyán Qulí was murdered in 760 H. and the puppet Tímúr Sháh set up, there was something like general anarchy, various Amírs seizing provinces and asserting their independence. The whole of Máwará-un-Nahr was seized by an Amír whose

BUYA'N QULI'.

No. 18. Æ. 1·2; 111 grains. Akhúr, x57 H. My cabinet.

الملطان | ٥٧ الاعظم خاقان المعظم | ابوالمظفر
خان | بو .... خلد | الله
ملكه سكه...ب | اخور
لااله الا هوالعزيز الحكيم...له......

و الله الغني | و انتم الفقرا | لااله
| ...الله | محمد رسول الله
...... | عمر | ...ا .. | على

No. 19. Æ. 1·2; 119·5 grains. Samrqand. Mr. Rodgers.

السلطان العا | دل بويان قلى | خلد الله ملكه
| ~٩٢/~

لااله الا الله | محمد | رسول الله
| ضرب | سمرقند
ابوبكر | عمـ... | عثمان | على

No. 20. Æ. 1·25; 118 grains. Samrqand, 7xx. Dr. Stulpnagel.

الملک لله | العدل الملكبوا |
الخاقان ♀ العادل | بويان قلي خان
| خلد ملكه

لااله الاالله | محمد | رسول الله | سكه—
سمرقند | صلى | عليه | رمضان | في سنه
| .. . | .... | سبعمائة

No. 21. Æ. 1·55; 116 grains. Samrqand, 755·4 H. My cabinet.

السلطان العا | دل بويان قلى | خلد
الله...لكه * خان * | ......
| سنه خمس و خمسين | سبعمائة

لااله الا الله محمد | رسول
الله | سكه | سمرقند
في | سنه | [احد] ... |
...... | ...... | ......

No. 22. Æ. 1·25; 120 grains. Samrqand, 754 H. My cabinet.

السلطان الاعظم | بويان... ♀ خان
| ... | ملكه | ...... | سمرقند

لااله...الاالله | محمد | رسول الله |
ابوبكـ ... | عمر | عثمان | على ...... | في
شهو ... | سنه | اربع | و خمس | وسبعمائة

No. 22 A. Æ. 1·2; 122 grains. Samrqand, 7x5 H. My cabinet.

الرحمن | المظفر على اعداي | السلطان
العادل | بويان قلي خان زيد عدد | ♀
...... | ...... | ...خمس | ......
| ...... | سبعمائة

No. 23. Æ. 1·25; 15 grains. Samrqand, 755 H. My cabinet.

السلطان العادل | بويان قلي ♀
خان | خلد الله ملكه
في شهور | ...... | خمس
و خمسين و سبعمائة

لااله الاالله | محمد | رسول
الله | سنه | ٧٥٥
سكه | سمرقنـ... | ابوبكر
عمر | ......

No. 24. Æ. 1·2; 124 grains. Utrár, 752 H. My cabinet.

العادل | بويان قلي خان | خلد الله ملكه | ♈
...... | اترار | ٧٥٢ | ......

No. 25. Æ. 1·25; 118 grains. Utrár. My cabinet.

الخاقان العادل | الاعظم بويان قاي
| خلد الله ملكه | ... | اترار |
......سموات و ما فى الأرض......

......حفظهما و هو العلي......

Ditto. Samr-Utrár. My cabinet.

سكه | اترار

ا قان العادل | الاعظم بويان | خلد الله
ملكه | سكه سمر اترار | زيد عمر
...... | ...... | عمر | علي

No. 26. Æ. 1·25; 122 grains. Bukhárá, 756 H. My cabinet.

| محمد | ... | الا | اله | لا
٧٥٦ | بخارا | ل الله | رسو
...... | ...... | عمر | ابوبكر

...سلطان العادل | ... ان قلي خان‌خل... |
له ملكه ♈ و زيد | الله عمره سكه | بخارا

No. 27. Æ. 1·25; 123 grains. Bukhárá. My cabinet.

ضرب—بخارا

لسلطان العادل | بويان قلي خان | خلد الله
♈ ملكه | سكه | بخارا

No. 28. Æ. 1·25; 122 grains. Kash, 753—4 H. My cabinet.

٧٥٣ | سكه كش

السلطان العا | دل بويان قلي | خلد الله
ملكه...
في شهور | ...... | ...... | ♈\ـــ

No. 29. Æ. 1·25; 126 grains. Kash. My cabinet.

سكه | كش..

السـ | بويان قلي بها...خا... | خلد
الله ملكه | ... | ♈

Ditto. Soghd. Count Stronganoff.

سكه صغد |

خان | الخاقان | العد ... | العادل
| بويان... | خلد ♈ الله

BU'AYA'N. ? Seldúz. After Búyán Qulí was murdered in 760 H. and the puppet Tímúr Sháh set up, there was something like general anarchy, various Amírs seizing provinces and asserting their independence. The whole of Máwará-un-Nahr was seized by an Amír whose name is generally written Bayán Seldúz بيان سلدوز, spelled "Biaun Suldoze" in White's *Institutes of Timur.* He seems to have governed in a way, though a dissipated hard-drinking Amír, and to have been put to death by Tughlaq Tímúr Khán (ruling in Eastern Turkistan) *circa* 764 H. It seems possible that the two following coins may be his.

No. 30. Æ. 1·25; 121 grains. Madínatu-l-rijál Tarmaz, 764 H. My cabinet.

العدل الملک | +◇○◇+ | بوايان ٧٦٤   سکه | مدينه ♀ الرجال | ترمذ

Ditto. ? Bukhárá, 7xx H. Mr. L. White King.

...عدل الملک | +○-○-○+ | بوايان   سکه | بدار ♀ ضرب | ...را ◎

Doubtful coins.

Æ. 9. (? Duá.) Badakhshán, 69(4) H. Count Stronganoff.

♀ سکه بدخشان سنه اربع و تسعين
و تسعمائة   لا اله الا | الله محمد | رسول الله

No. 31. Æ. 1·2; 120 grains. Mahmu[dábád], x27 H. Mr. Rodgers.

[عمارة] مالک... | ◇✿◇—[عدله] | ال ٢٧ سکه ما... | محمو♀......

No. 32. Æ 1·2; 124 grains. Samrqand, 753 H. Mr. L. W. King.

...طان ابو | لعادل [ناصر الد] ين بويان قلي | *♀*   سکه سمرقند | ٧٥٣

Ditto. Without mint, 754 H. Ditto.

In these two coins and in some others, Búyán Qulí calls himself Náṣiru-d-dín.

KATLAGH KHWÁJA, the son of Duá, who with his father invaded India, and appears to have been at Jalandhar 696, as far as Delhi 697-8, and Lahore 701 H. (See Zia-ud-din Barni, and D'Ohsson's account.) His copper coins, like the two following, are not uncommon in India.

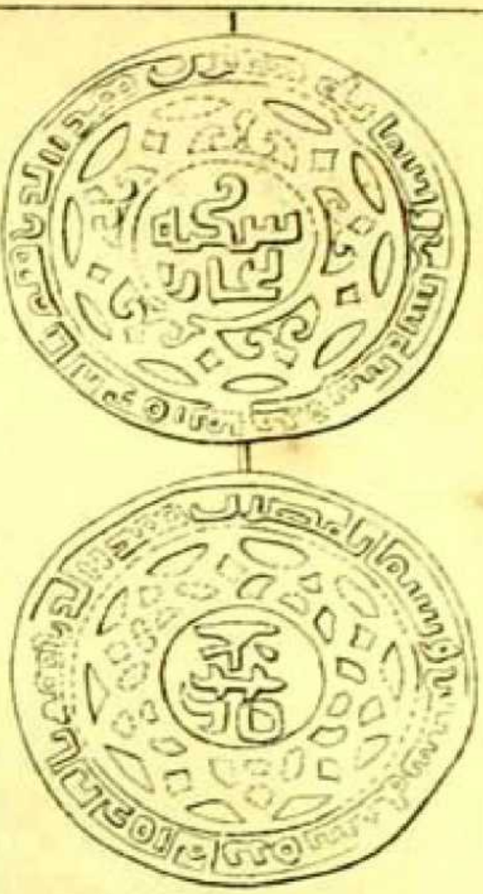
No. 33. Æ. ·6; 53 grains.

ضرب لو... | ♀   سه...حضرت... | س...

No. 34. Æ. ·6; 52 grains.

ضرب...سلور | ♀   [قتلغ] | خوجه... | سد

1



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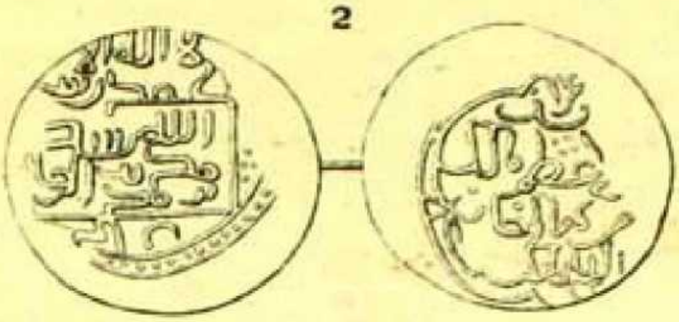

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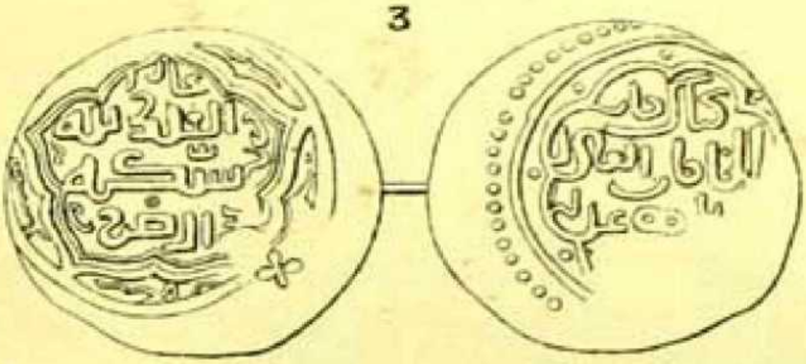

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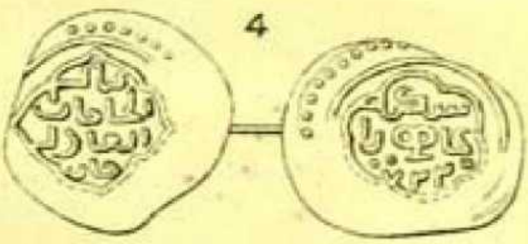

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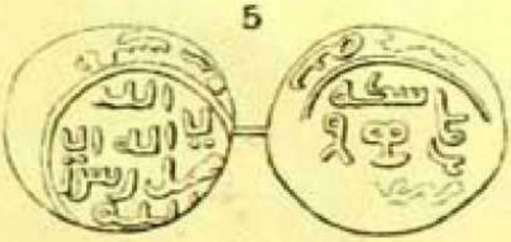

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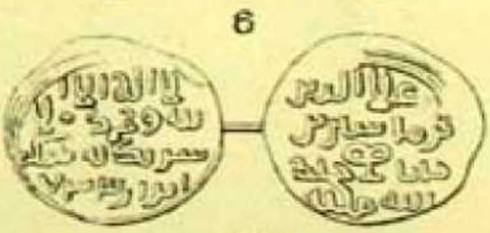

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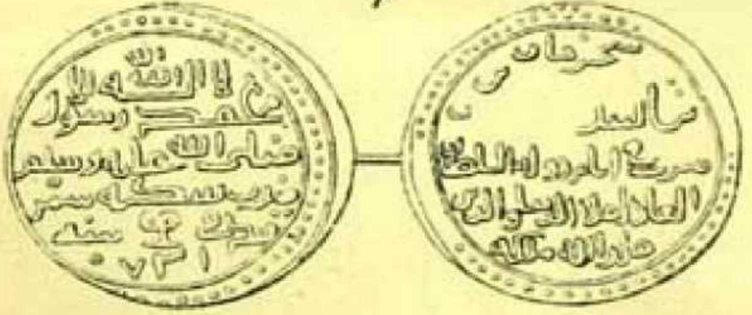

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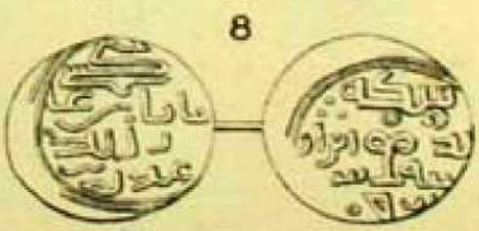

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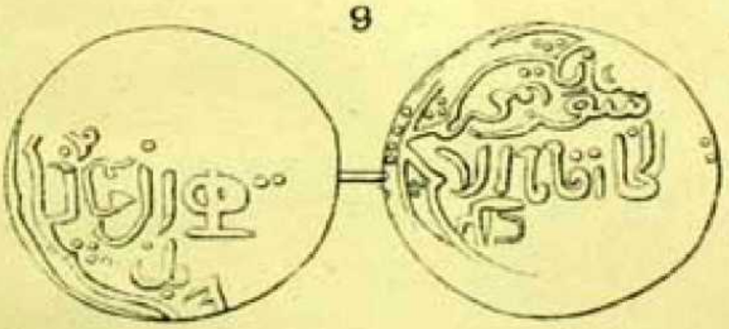

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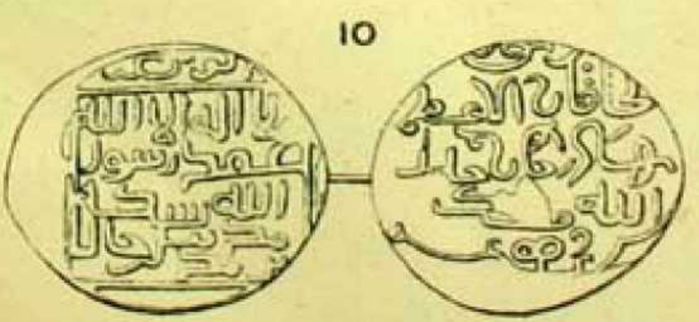
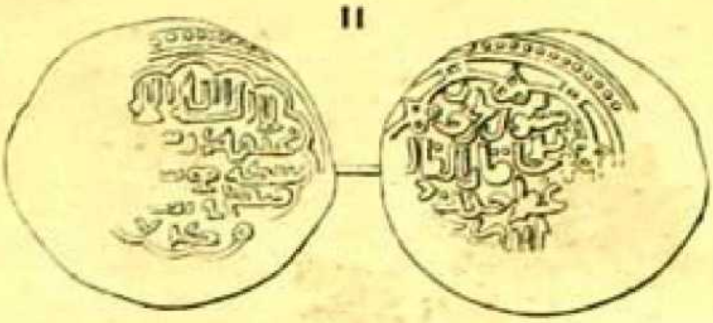


COINS OF THE CHAGHALTAI MOGHALS.

Reg No 308, As Soc.—16-6-90—640

Zinco., S. I. O. Calcutta.

11



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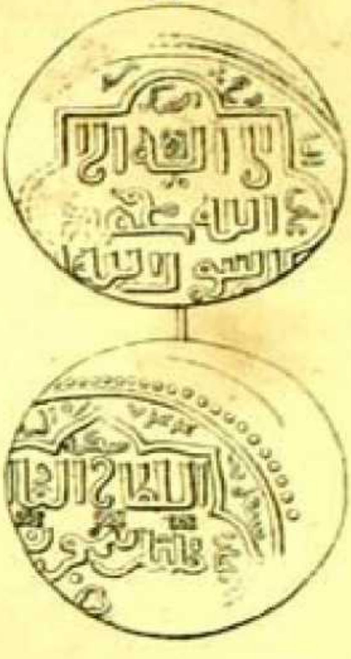

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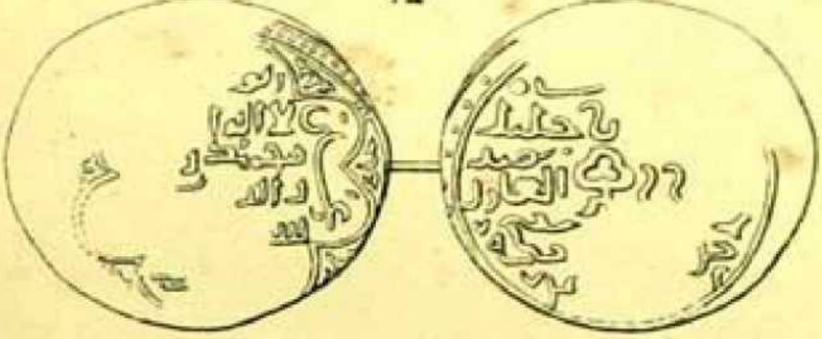

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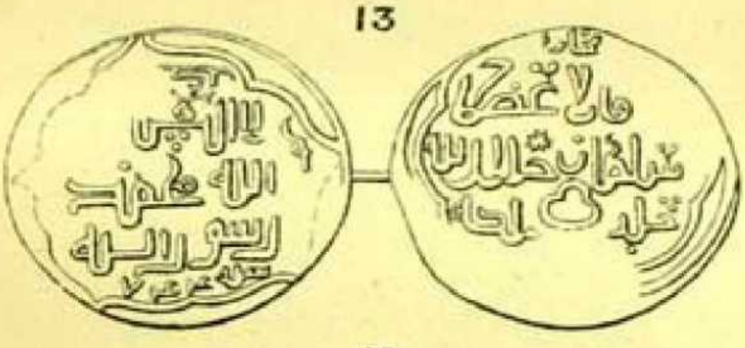

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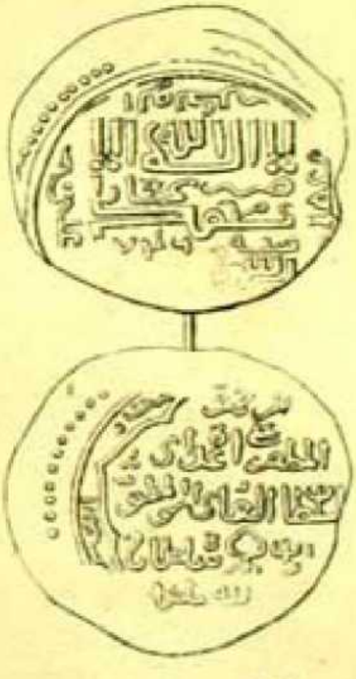

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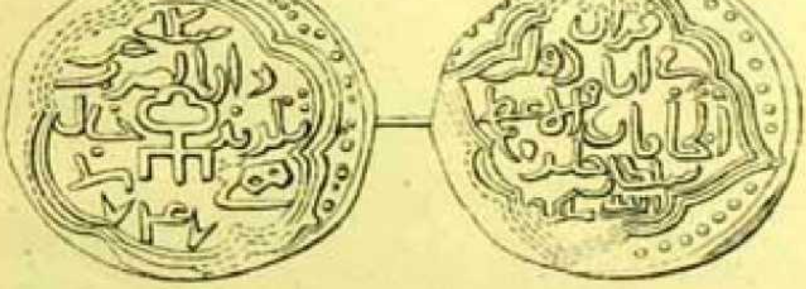

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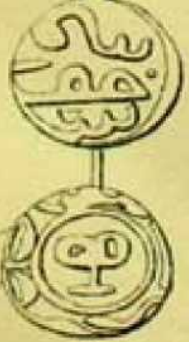

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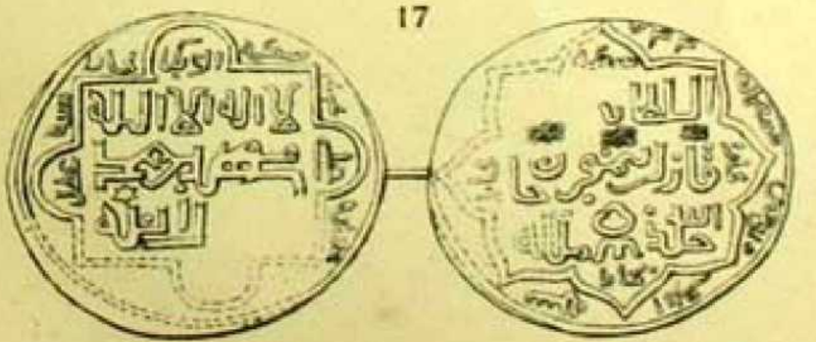

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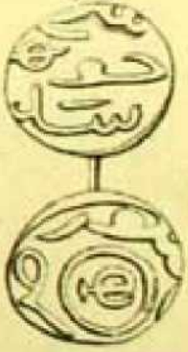
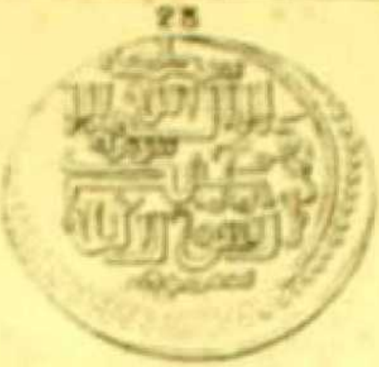


COINS OF THE CHAGHALTAI MOGHALS.

Reg. No. 924. As. Soc.—25-3-91.—850

Zinco., S. I. O. Calcutta

23



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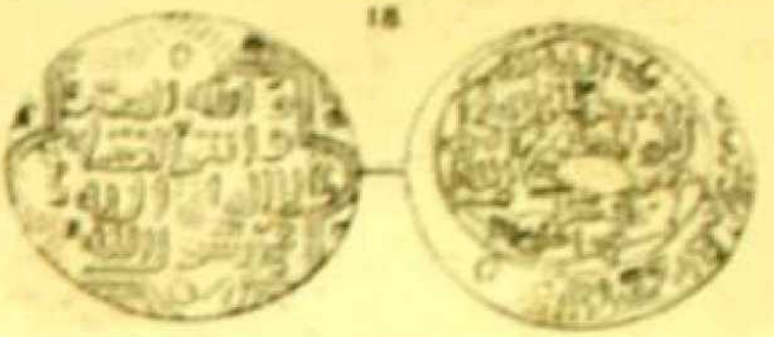

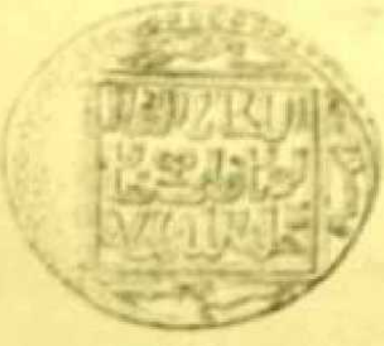

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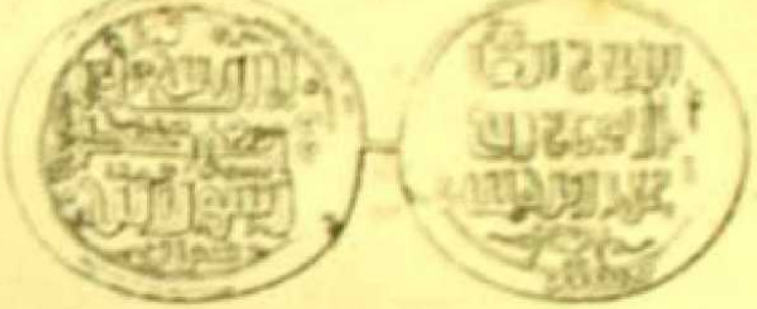

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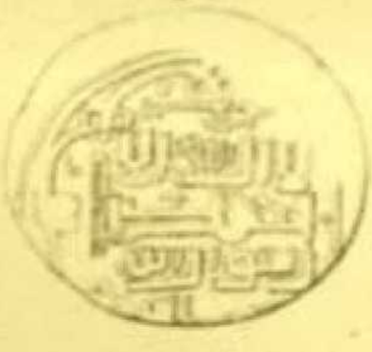

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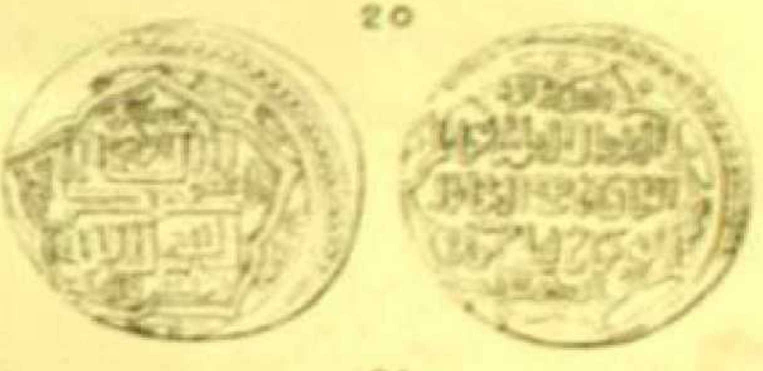

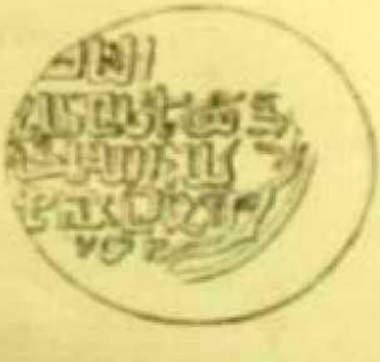

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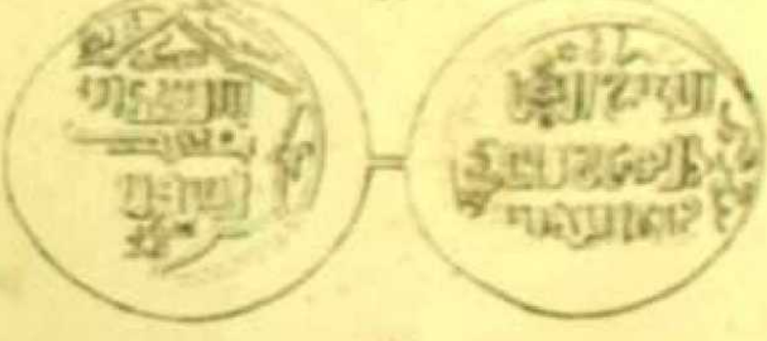

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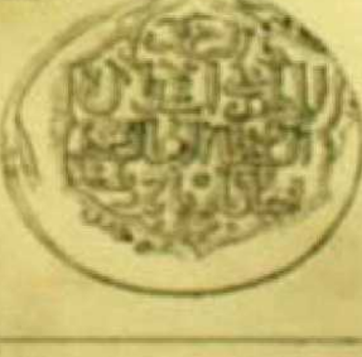

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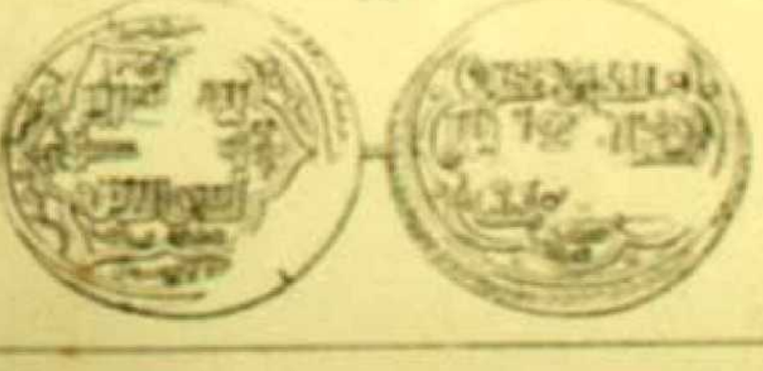

COINS of the CHAGHALTAI MOGHALS.

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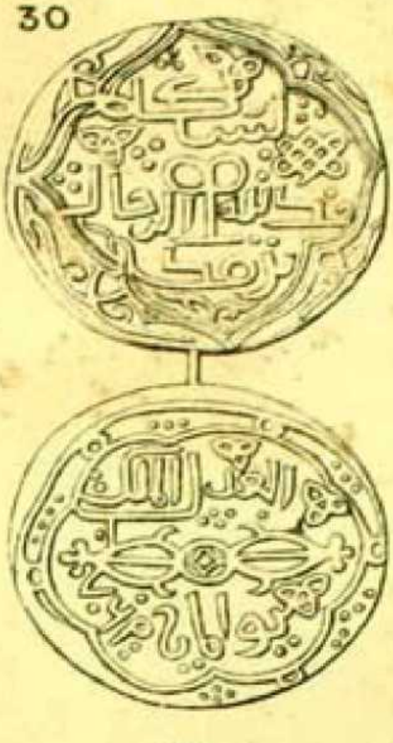

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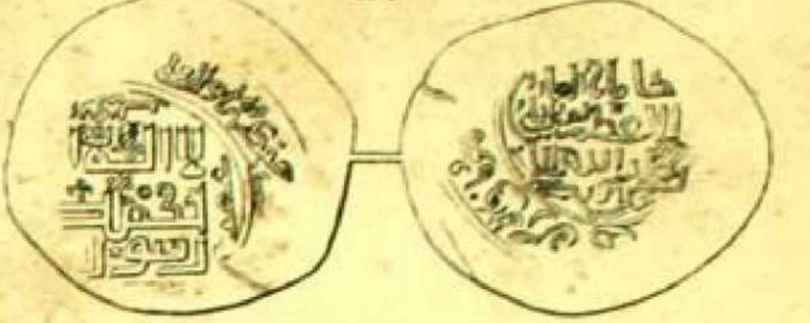

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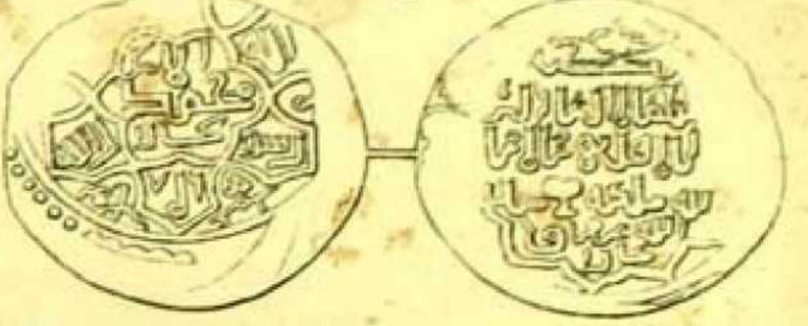

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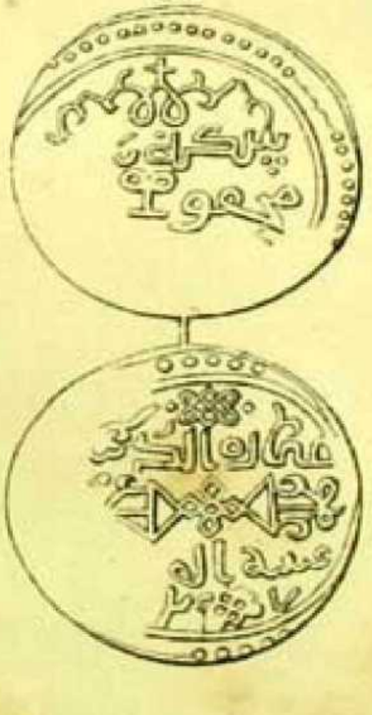

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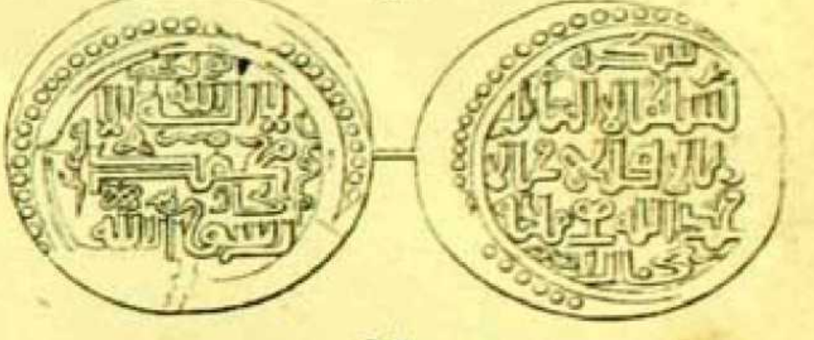

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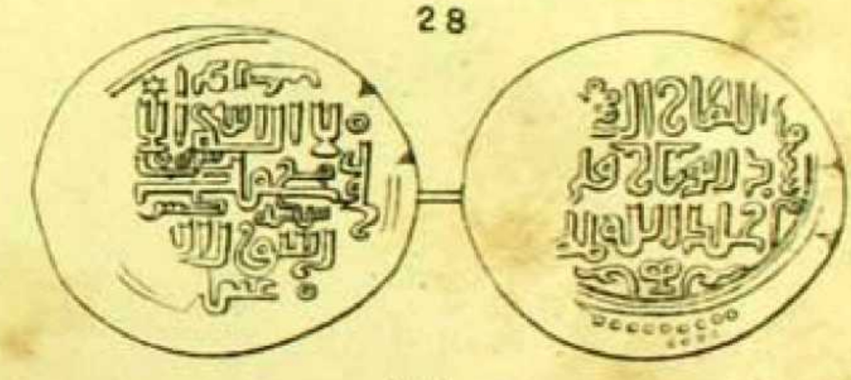

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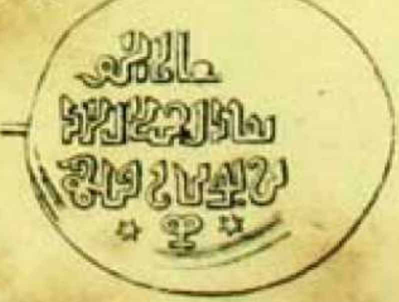

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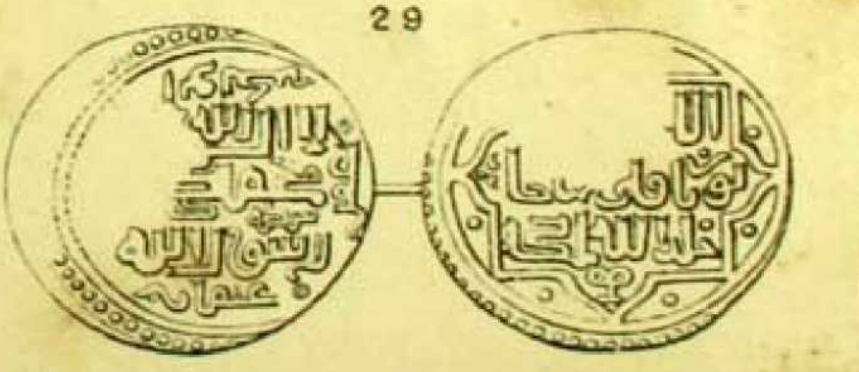

COINS OF THE CHAGHALTAI MOGHALS.

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JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

Part I.—HISTORY LITERATURE, &c.

No. II.—1891.

Report on the Boria or Lakha Medi Stúpa near Junagaḍh.—By HENRY COUSENS, M. R. A. S., *Archæological Surveyor of Western India.*

(*With a Plate.*)

On the 27th of January, 1889, I received a demi-official from the Director-General, Archæological Survey, enclosing a cutting from the *Morning Post* in which was given a short account of the opening of a *stúpa* near Junagaḍh, Kathiawaḍ, by Mr. J. M. Campbell, C. S., directing me to take immediate steps to ascertain what was being done. On the same day I wrote to Rao Bahadur Haridas Viharidas, Divan of Junagaḍh, and in reply was told that Mr. Campbell had, during the Christmas holidays, commenced the excavation of the *stúpa* in question, and had left instructions with them for its continuance. I then wrote to Mr. Campbell (letter No. 12 of 31st January 1889) asking him what had been done, and what was still doing, and received from him a statement of all that had been done up to that time. In his note accompanying it, he said that, should anything be found, he would be immediately informed, and would try to return to Junagaḍh for a few days. On the night of the 15th instant, I received a telegram from the Assistant Divan of Junagaḍh from which I understood that a 'find' had been made. The Assistant Divan, Mr. Ardesir, wrote me at the same time, but the letter did not reach me then, as I started early next day. At Dhola Junction I met Mr. Campbell, and we went together to Junagaḍh. The next morning we went out to the *stúpa*. But before describing the 'find,' I will try and describe the position and surrounding of the *stúpa*.

At the foot of the southern slopes of Girnar whose precipitous cliffs rise a short distance to the east of Junagaḍh, is a small secluded valley—an amphitheatre among the hills—almost entirely surrounded by the latter. It is about six miles from Junagaḍh, and the only path to it leads for some distance along the course of the river, past the celebrated Aśoka Rock, and crossing an intervening spur, debouches at once into it. It is thickly wooded, and the bush and scrub, with a good sprinkling of larger trees, climb the hill sides to near their summits. At every turn in the path, lovely glimpses of the surrounding scenery are seen through the foliage, and many a charming view is further enhanced by its vivid reflection in an occasional pool in the watercourses crossed in the way. The great rugged sides of Girnar, with its everlasting rocks, kissed by the lingering rays of the rosy sunset, and begirdled with a cloak of varied tinted foliage, now fading into the softest pearly greys, is a picture one loves to linger before. Around us, beside this old patriarch among hills, we have in the south-east the heights of Gadesing, crowned by its ruined fort, on the south-west Dátár-no-dongar, with the hills of Mákhán Kundi, Taktakgiyo, Sazadiári, and Pavandhoda between, and the low pass on the eastern slopes of Girnar known as Súrya-kund-ki-godi. In the middle of this beautiful valley, then, thus cut off from the outside world, upon a rocky knoll, stands the great mound known as the Boria *Stúpa* or the Lakha Medi (the abode of Lakha). The ground on every side between it and the western edge of the valley is strewn with fragments of bricks, and here and there are small mounds which look much like the remains of little *stúpas*. Directly eastward of the big *stúpa*, and on the eastern edge of the valley, is the small temple of Bor Deví, so called from the Bor trees which surround it.

On our arrival at the *stúpa* we found that a relic casket had been unearthed. The digging that led to its discovery is described in Mr. Campbell's notes attached, from which it would appear that the depth of the casket from the summit of the mound was 39 feet. During the excavation the top of the mound had been cut off to a depth of 22 feet, and a trench 20 feet wide at the top had been driven from the east straight into the centre. The sides and floor of the cutting shew, that the whole *stúpa* was built of close horizontal layers of good brickwork in herring-bone bond, and it is a solid compact mass. The bricks are of the old Buddhist type, measuring 18″ × 15″ × 3″. Whatever the state of the upper portion, which has been cleared away, may have been, the lower part now standing is solid enough to allow a perpendicular cutting to be carried down without fear of the sides falling in.

During the excavation various slabs and fragments of sculptured stone (Junagaḍh freestone) were met with, most of them having been found about the vertical axis of the mound. They were numbered as found, but owing to no plans or sections having been plotted as the work progressed, there was some little doubt as to the positions of some few fragments. The two great heavy rail slabs were no doubt placed in the positions in which they were found for the purpose of the better securing the relics from any burrowing thief. The others were probably put in without any special purpose.

Before describing these fragments it will be as well to revert to the relics. See Plate V. On our arrival at the mound on Monday, the 18th February, we entered the trench and found the stone coffer, with its lid upon it, standing on one side (west) of its original bed. As far as could be seen, it had been placed in the vertical axis of the mound, and, from measurements taken by me, and the statement that it was at a depth of 39 feet from the original top, I conclude that it occupied a position in the centre of that axis. On finding the box, Mr. Ardesir had it lifted to one side to see if there was anything beneath it, but he kept its bed undisturbed so that we could see how it was placed. From the discovery until we arrived a day or two had elapsed, during which time the coffer had been left standing in the trench under a guard, but had not been sealed or otherwise made fast. This outer receptacle consists of two blocks of white free stone, one upon the other, the upper serving as a covering to the lower. The block had been placed, so far as I could see by the marking of the bed, with its sides facing the cardinal points. Upon lifting off the upper slab we found a small circular well in the upper side of the lower stone, closed by a thin circular slab which rested upon a shoulder inside round the top of the well. On lifting out this little cover, whose top was flush with the top of the slab, we found inside a small stone pot with lid. The shape of the lower part of this is that of a shallow bowl, while the upper, or lid, was like an inverted saucer with a lip on its underside. This pot was very nearly as big round as the well in which it was placed, and it was with some little difficulty got out. The bowl or the lower part of the pot is perfectly plain, but the top has, by way of ornament six concentric grooved circles. The material out of which it is made is a dull red claystone, and the whole has been turned very neatly upon the lathe. This is evident from the circles, where the tool in its progress round has very slightly chipped or serrated the edge of the circles. A curious thing about this pot, and which will be noticed again presently, is that the lid does not fit the bowl, being too big for it, its lip overlapping and resting on the inner edge of the bowl instead of dropping into it. Within the well, surrounding this pot, was found a small quantity of gritty powder.

In the stone pot was found a little copper pot in two parts like the last—bowl and lid. Thus far had the pot been opened by Mr Ardesir before our arrival. The copper pot being encrusted with green verdigris was not so easily opened, and the further opening of the vessels was entrusted to me. To open the copper pot, I had to insert the blade of my penknife between the lid and the bowl, and by gentle leverage force the former off. The general shape of the copper pot is that of the stone one, being slightly rounder. But it has an addition of a little drum-like protuberance forming a kind of handle to the lid. When the copper pot was opened a silver pot of the same shape was found within, while underneath it, and between it and the sides of the copper pot, was a dry brittle substance covered with verdigris. This, on close inspection, has the appearance of compressed vegetable matter, bearing the impress of the silver pot on it. It looks as if some green (moist) grass-like vegetable had been put in, and the silver box added and pressed down upon it. Its moisture had greatly corroded the inside of the copper vessel up to a line above the junction of the lid. Beyond this, the interior of the dome of the lid was not corroded, being apparently protected by the intervening silver box, and this part had a purplish metallic sheen which is probably the result of fire when heating out and shaping the lid. The corrosion had eaten a considerable hole in one side of the bottom of the bowl.

The silver box was quite bright. The only difference between this and the copper one being in the shape of the knob on the top which has a narrower waist at its junction with the top of the dome of the lid. This, on being opened, revealed a bright little gold box. Between the two was a small quantity of very light knobbly brown stuff which on close examination and under a low power microscope appeared to have a distinctly fibrous texture. To me it appeared to be a mouldy or fungus vegetable matter.

Great interest and curiosity now centred round the opening of the gold box, and the lid was removed amidst much speculation as to its contents. Its shape differed from the others only in the shape of the knob on the lid which was here conical. In the box we found the relic and a few grains of coaly grit, accompanied by the usual five offerings, in this case comprising an aquamarine (?) bead, a ruby, a sapphire, an emerald, and a small piece of dry twig or white coral with a smaller chip of the same. The relic upon close examination seems to be a small chip of stone that has been under the action of fire. It is a flake about ⅜ of an inch long by ¼ of an inch broad, of a dull yellowish drab colour with darker smoky stains. Its surface is cracked all over as if by fire. Under the microscope the surface appears to be covered with fine grains of sand of various hues and dimensions. A lower power shews

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the surface as blocks of rock with the rifts or fissures (the cracks) filled with gravel. It is most certainly *not* bone, nor does it appear to be burnt clay, unless it has been burnt into hard stone ware. The gritty substance under the microscope looks like lumps of coal of various sizes, and to the naked eye as a few grains of different sized gunpowder. The bead which is the largest jewel, is in cross section triangular with rounded corners, one side being much longer than the other two, which, themselves, are unequal. The bead, in its length, has thus three faces. The hole has been drilled from both ends, which is evident from the meeting in the centre not being quite true. It is transparent, with a slightly, but decided, green tinge, and Mr. Campbell thinks it an aquamarine. It may be crystal. The ruby, which is ruby-coloured by reflected light, is of the colour of strong tea by transmitted light. It is in the shape of a very flat cone, the diameter of its base being about $\frac{3}{16}$ of an inch. The sapphire is a deep blue by reflected, but a lighter blue by transmitted light, while the emerald is light opaque green. These two stones are smaller than the ruby, the emerald being the smallest. Now we come to the last article, which has all the appearance of a piece of dried twig, though perhaps a trifle heavy for such. It is about $\frac{5}{8}$ inch long and nearly $\frac{1}{4}$ inch in diameter. The outside is covered with fine parallel lines or scoring, running with the length of the substance, and on it are one or two eyes where leaves or small branches may have been attached. It is of an uniform grey tint. The fractured ends or sections do not, however, shew any woody texture, but is more solid looking. In the five offerings made to images, and at the consecration of Hindu temples, the coral always forms a fifth with jewels, but then it is generally the red coral. It is not unlikely that this may be a piece of coral too, but of the white kind. The nature of the bead requires a professional opinion to decide. The usual five offerings in Hindu shrines are—a diamond, a ruby, an emerald, a pearl, and a piece of coral.

The relic boxes were carefully examined, but no trace of inscription or of single letters could be found, nor has any coin been discovered. We are thus still without any clue to the age of the stúpa, unless we get it in the fragments of sculptured stones which may yet be excavated. On the 20th the relic boxes and the contents of the small gold box were photographed full size.

The excavation is still being continued, and when we left the mound on the evening of the 19th, a well had been sunk in the brick work to a depth of 8 feet below the centre of the position, where the coffer stood; but without anything more being found.

The sculptured stones that had been found are themselves full of interest, and if the remaining portions of the structure of which these form part can be discovered, the trouble and expense in getting at them will be amply repaid. The top member of the Tee or triple umbrella is a huge heavy slab one foot two inches thick. The edges round are broken away, but one image mortise remains at one corner, 3 feet 4 inches from the centre. The centre of the slab is pierced with a large round hole, 1 foot 3½ inches in diameter, to receive the stem of the umbrella. Three-fourths of the entire rim of the great umbrella were found, and they all piece together remarkably well, and give a diameter of 10 feet and a thickness of 1 foot. Four fragments of the four supporting images (one of each) have also been found, and the tenons under their feet correspond with the mortise in the top of the Tee. In the lower edge of the umbrella rim are the corresponding mortises to receive the tops of the images. The underside of the umbrella is slightly hollowed out. The whole was originally in one piece, but as yet the central parts and the remaining fragments of the rim have not been found. Nearly half the collar, however, with portions of the two upper ones, of different thickness, have been excavated. The holes in these decrease in size. Portion of a smaller figure, probably from the second tier, has been recovered. In the top of the big umbrella are four mortises immediatly above those below, but near the centre, for the feet of these upper images. In the edge of the umbrella small holes are drilled through half way, between the images and about ⅝ inch diameter, apparently intended for hangings or the sticks of small flags. There are many other fragments and slabs whose original use cannot as yet be definitely determined, but in addition to these are the fragments of two lengths of rail slab, 8 feet 3 inches by 3 feet 5½ inches. These have long tongues at either end to fit into long mortises in some supports not yet found. The surface is carved into uprights with three bands of rail running through them. On the upright struts are incised central circles with a half circle at top and bottom. The length of these slabs is the length of a side of the original polygonal railing round a *stúpa* or structural dagoba.

The question which now requires solution is, whether the triple umbrella was an erection over a previous *stúpa* or over a structural dagoba. That it was never erected over the present *stúpa* is self-evident from the positions in which the fragments were found. If a larger *stúpa* existed on this spot, it is very unlikely that it would have been pulled down and rebuilt. It would have been repaired if necessary or an outer casing added. It is my opinion that a structural dagoba existed probably on this spot *before* the *stúpa*, and the triple umbrella being so top-heavy fell and was smashed as we find it; and in this was enshrined the present relics. Finding how unstable this arrangement was, the Buddhist determined to build the present *stúpa*, and the fragments of the old dagoba, which had to a certain extent become sanctified by its use as a relic receptacle, were buried in the mound. I should thus not be surprised, if the bulk of this original structure be found at the ground level, being thrown in to help to get the required height for the relic coffer.

It has been decided to carry on the excavation to the rock; and I estimate that there are 35 to 40 feet of brick work between the position of the coffer and the foundation. I have advised that a well be continued down through the centre, a sloping approach being made to it from the east along the present cutting. Then, if necessary, the cutting east and west might be carried straight through the mound down to the foundation. If nothing is found, then it will be needless to demolish the mound in the chance of finding anything in the two halves. If, on the contrary, my suppositions are correct, and the remains of some structural dagoba be found scattered through the mound then nothing is left for it but to clear away the whole.

At a point in the mound at about 4 feet from the coffer, and on the same level, was found a handful of broken chips. These were the fragments of a pot of exactly the same material as the stone pot containing the relics, and on piecing some of the fragments around the lip of the cover of the latter they were found to lie evenly to it and to have exactly the same curve. I have already mentioned the little trouble we had in getting the stone-pot out of the well, which was a good deel deeper than it, there being hardly enough room round about it to get the fingers in. The inference I draw from this is, that the original bowl, of which the present lid was its cover, is now represented by these fragments. The accident probably happened thus. After enclosing the copper box within the stone pot, the latter was being let down into the well, when, from the small diameter of the latter the priest's fingers slipped from the bowl to the lid. The bowl fell into the well and got broken while the lid remained in his fingers. The fragments were then taken out and cast aside, and a new bowl obtained which did not quite fit the lid. The immense pressure of the mass of brick work above reduced the fragments to chips as we find them. But the amount of these is quite sufficient to build up a complete bowl as large as the whole one.

It is curious that no heads of images have as yet been found.

I have not been able to revisit the *stúpa* since my first visit, but have been informed that nothing of any consequence was found upon further excavation.

Notes on some Kolarian Tribes. No. II.—*By* W. H. P. Driver.

The Koroas.

Habitat.—Koroas are to be found scattered over various parts of Chuṭiyá Nágpur, from Palamu in the north down to the most south-western of the Native States. They are in various stages of civilisation, from the Birhor-Koroa of the jungles to the cultivator on the plains who prefers to call himself a 'Kisán.'

In Palamu they call themselves Korea-Muṇḍas rather than Koroas, and in Sirguja and Jaspur they like to be called Paharias, the name Koroa being looked upon as a term of reproach.

Language.—As usual when branches of any tribe become isolated, the Koroas in different districts have various dialects, and the following are a few samples of differences between the Baroai and Manipat Koroas.

English.	*Baroai Koroa.*	*Manipat-Koroa.*
White ant	... Bunumku	... Santi.
Bear	... Nunikmai	... Bana.
Blood	... Chala	... Balgi.
Bone	... Kod	... Jang.
Body	... Harom	... Sindir.
Cloth	... Pagi	... Sonhe
Hair	... Silik	... Ub.
Thigh	... Bul	... Tob.
Lie	... Lobra	... Buri.
Mouth	... Totna	... Ah.
Rice (cooked)	... Kode	... Jow.
Word	... Balda	... Barra.
There	... Inandera	... Hona.
Far	... Sanging	... Langka.
That	... Man	... Mader.

Traditional and Conjectural History.—The Koroas like other wild tribes know little of their own history, but they have traditions about the Mahádeo Hills, and the same fiction as the Asurs about their origin, *viz.*, that they are sprung from scarecrows. Their traditions also connect them in a distant way with the Korkus, Kurs, Saonts, Asurs and Beonarias.

When these aborigenes were driven south by the Aryans they appear to have been generally known amongst themselves as Kors, their word for man. The more eastern branch of the Kolarian race was in those days evidently known as Horo. To this day the members of the eastern branch can be distinguished by the use of H, where those of the western branch use the letter K. From the remains of brick and stone temples, it would appear that in ancient times small communities of Aryans used to settle amongst these aboriginal tribes, perhaps at first as conquerors, but afterwards on a more familiar footing, until with the lapse of time they became absorbed in the Kolarian population. Traces of mixed blood are plain enough amongst the population of this part of the country at the present day.

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* [Continued from Vol. LVII, p. 7, of 1888. Ed.]

Authentic history.—The earliest historical fact we have in connection with the Koroas is, that in 1818 A. D., when Sirguja and Jashpur were ceded to the British by Appa Sahib, the Koroas, under a chief named Manawar Sing, were at war with the Rája of Sirguja. Then in 1857 the Koroas of Sirguja went into open rebellion against the British Government, and one of their chiefs Dharam Sing was hanged after we regained the country. Again in the beginning of 1884 this same tribe (probably owing to scarcity) took to highway robbery and murder. The ring-leader on this occasion was one Katra, and he and three others, named Bandhan, Jitu and Ledra, were tried and hanged at Ranchi. Of the others implicated, two more, Dunde and Punea, were transported, and another Bandan received five years' imprisonment. It is said that in years when the hill Koroas crops were scarce, they used to pay a visit to the Rája in a large body, armed with their terrible bows, arrows and battle-axes. The Rája in those days was only too glad to get rid of them by ordering a general subscription for their benefit. Alas! now, gone are the days of "the good old rule, the simple plan," and the British are here to maintain law and order.

Divisions.—The Koroas are divided into several sub-tribes, the Pahariá or Bor-koroas, the Birinjia-koroas, the Birhor-koroas, the Koraku-koroas, and the Koria-muṇḍas. All live amongst the hills and jungles and speak dialects of the Kolarian language. The Daud-koroas or Dih-koroas and the Agaria-koroas live on the low lands, and speak only a dialect of Hindí.

Food.—In the way of food, Koroas of the hills can eat goats, pigs, fowls, cows and buffaloes, but not snakes, or frogs or lizards. Only Birhor-koroas can eat monkeys. They all eat various jungle products, and many of them know of the medicinal properties of herbs, roots &c., to be found in their jungles. The following are the names of a few such medicines, *viz.*, Churaphal, Gethi, Bhourmali, Barkajeri, Harraphal, &c.

Religion.—Koroas employ three kinds of priests, who must, however, all be Koroas. The Pahan-Baiga is the head priest, the 'Pujár' is his assistant, and the Dewar is the consulting priest. They also have Ojhas, Dains and Motis, *i. e.*, wizards, witches, and sorcerers, who deal with various kinds of spirits, and work on the superstitions of the people. The mediumistic powers of such people are supposed to be innate. Koroas worship the sun. Once a year in the month of November, the religious-minded Koroa goes out by himself, before dawn, to meet the rising sun, and without the assistance of a priest, he offers up a sacrifice of a white cock, upon an open field. The priests offer their sacrifices under the Sarna of sal trees, which is to be found near every village. Darha and Darhin are worshipped in the Sarna, and the hinduised Koroas of the plains worship Kálí in a temple. A red or spotted cock is offered to Darha and a red hen to Darhin, and to these are added a little 'Handia' or native rice beer, which the soul of the Koroa loves. There is also a Paht Deota or hill god who eats red cocks. On occasions of distress the Baiga offers an oblation of milk to Kálí. The goodwill of 'Arha Buṛhi' (their ancestors) is invoked on any occasions of moment.

Festivals.—At the 'Phagna' festival, in March, a 'simal' (cotton tree) branch is planted on the east side of the village, straw is tied on the top of it, and then set fire to. After drinking and dancing round this, the Baiga cuts off the top with a 'balua' (battle-axe). He then takes and sticks it over his own door, and offers a sacrifice of a spotted fowl, and some bread made of rice flour. This festival lasts for two days, and they dance the 'Tharia' and 'Jhumta. The 'Sarhul' festival, in April, lasts four days, a red cock and hen are sacrificed and they dance the Jhumta and Chandrani. Once a year, in the month of July, the Pahan sacrifices to Kálí a 'khassi,' goat which the whole village subscribes for. At the 'Nowa' or first crop festival in September, the dances are Chandrani and Desoari, and only a hen is sacrificed by the Pahan, but after the harvesting is over, every Koroa household offers a thanksgiving sacrifice of a red and white hen to ancestors. The 'Sohorai' or cow festival, in September, lasts four days, and two red cocks are the proper sacrifice on this occasion. At the 'Dassain,' in October, the Diwan of Khuria sacrifices a 'khassi' goat. The Karma festival, in October, lasts two days. The villagers cut a branch of a karam tree, plant it in the middle of the 'akhṛá,' or dancing-ground, and drink and dance round it. At this the Chandrani is the proper dance.

Marriage ceremonies.—Although Koroas do not marry until they are grown up, their marriages are often arranged by parents. The would-be-husband has always a say in the matter, and in his eyes, working-capabilities are the chief beauty in a wife. Koroas are divided into several families, each of which is known by its 'gotor,' and no two people of the same gotor are allowed to marry. The gotor stands for our surname. An orthodox marriage is conducted as follows. First the betrothal is formally gone through by the parents of the bridegroom, taking to the parents of the bride two 'kalsis' of 'daru' or native liquor made from the 'mahwa,' and settling the price of the girl, which is generally about Rs. 5. The young man goes with his parents next time and takes besides the Rs. 5, a 'khassi' goat, a piece of cloth for his intended, and another for his future mother-in-law. On the wedding-day a feast is given at the house of the bridegroom's father to which all relatives and friends are invited, and a party of the bridegroom's friends go and bring the bride. A person called an '*aguait*' arranges all the ceremonies. The clothes of the bride and bridegroom which have previously been dyed yellow are tied together by the 'Lokundis,' who must be unmarried people. The 'Lokundis' are the bridesmaids and bestmen. The bridegroom then puts 'sindur' on the bride's forehead, and the '*aguait*' throws a fist-full of uncooked rice on the ground. The happy pair then go and *salaam* to their parents and to the assembled company. They then seat themselves between their parents, and the husband puts bangles on his wife's wrists, and anklets on her feet. The company then begin to eat and drink, and afterwards the young people commence their dancing, which is kept up all night. The next morning, after a final drink, all the party go and bathe, and then leave the happy couple to their own devices.

Marriage customs.—A Koroa can marry a second wife, if he has no children by his first, or if his first wife leaves him, or if he is divorced from her. If his wife leaves him, he can get back her price, from her parents or guardians, and this is as good as a divorce. Widows can remarry, and a man who marries a widow or divorcee is called a 'Biyáhur.' If a man leaves his wife without a cause, she can call a 'pancháyat,' and have him find Rs. 5. When young people marry without their parents' leave, it is called a 'Dhuku.' The relatives then hold a 'pancháyat,' and make the young man give a 'khassi' goat and two 'kalsis' of 'daru,' for their benefit.

Birth customs.—For about a week or ten days after a birth, the mother is considered unclean. Children are named a month after they are born. They are only named after their grandparents, when the mother dreams of a visit from the said ancestors. If a girl is to be born, the woman dreams that either her own or her husband's mother came with offerings of 'tarpat' earrings or beads; but if a boy is expected, she dreams that either her own or her husband's father came with an offering of a 'dibi' or a 'batua' (small brass pots for eating out of).

The child is then called its grandparents' 'aotár,' and is named after the said ancestor. A big feast is always given at a christening. Boys are preferred to girls.

Young people.—Boys are burnt on the forearms, when they are about ten years of age, but girls are not tattooed like Muṇḍas, Kharias and Uraons. Property descends only to male heirs. Every large village has its Dhamkuria or bachelor's quarters, for boys who are too old to live with their parents. Girls stay with their parents until they get married. The dancing-ground is usually an open space in front of the Dhamkuria. Young people enjoy considerable freedom until they are married. There are no old maids amongst Koroas. Children take the 'gotor' of their father.

Death Customs.—When great persons die their remains are conveyed to the banks of a river and burnt by their relatives. Ordinary people are buried and large stones are placed over their graves. When the Pahan Pujár or Dewar die, their remains are burnt and buried in their own fields. Ten days after a death, the nearest relatives give a big dinner. When a pregnant woman dies, her ghost haunts its relatives and has to be turned out of the village with the assistance of the Baiga.

Appearance.—In appearance the Koroas of Jashpur, Sirguja and Barowai are usually very black with flat square faces, and matted locks. Physically they are short but very strongly made.

The Pahariyá-Kharias.

Habitat.—The Pahariyá-Kharias have little to boast off in the way of history, and those in the south-west have the same tradition as the Kharias of Lohardagga, *viz.*, that they came from 'Roides' and 'Kharia-gháṭ.' They are found scattered on the hills in the south of Mánbhúm, in various parts of Singbhúm and Kionjhar, and on the borders of Gangpur and Raigaṛh, and (as their name implies) they are exclusively hill men. At the foot of the hills in the thickest jungles are found the Perai-Kharias, who are said to have been outcasted by the hill men, and with them are also found the Makria-Kharias, both these tribes being gross feeders. The Makria-Kharias eat monkeys, and thus stand in the same position to the Kharias as the Birhors to the Muṇḍas. It is most probable that in ancient times all the Kolarian tribes ate monkeys.

Language.—There is a difference in the language of the hill and plains of one word in twelve, and the following are a few examples :—

English.	*Plains-Kharia.*	*Hill-Kharia.*
Cloth	... Lutui	... Sirak.
Fever	... Ghorna	... Tonor.
Flesh	... Mas	... Kumang.

English.	*Plains-Kharia.*	*Hill-Kharia.*
Foot	... Katta	... Jura.
Jackal	... Tuyin	... Karcha.
Monkey	... Bandar	... Sakoi.
Morning	... Meang	... Patar.
Plantain	... Kera	... Kondo.
River	... Ompai	... Jor.
To-day	... Musa	... Kone.
Near	... Ubdu	... Ekor.
Weep	... Yamna	... Libdana.
Bad	... Bekar	... Kambo.
Old	... Buddha	... Kendrubo.

Divisions.—There are two tribes of hill Kharias, the 'Pahariyá' and the 'Neosa.' The Pahariyás are the more civilized, being more fastidious as to their food, and wearing cloth, while Neosas are said to eat cows, and animals that have died of disease, and most of them wear only leaves. Neither of these tribes can speak any language but their own, but it is only with difficulty that they can understand each other.

Food.—Pahariyá-Kharias eat buffaloes, sheep, goats, pigs, fowls, &c., but not cows, tigers, snakes, lizards, &c.

Religious Festivals.—In religious ideas the Pahariyá-Kharias are wonderfully advanced. They worship the Sun, 'Giring Púja,' every two or three years, in the months of June or July, the head of every family doing his own púja, on a bare rock, and offering a white cock, a white goat, or a white pig, according to his circumstances. Every village has its priest, or 'Kalo,' who must be a Kharia, and his sacrifices are to be made at the 'Sarna' or Jangkorbo. In February there are three festivals. At the 'Phágun' festival each household offers its own sacrifice. At the Jangko festival, the Kalo offers a sacrifice for the whole village. This festival is kept in honour of the Mahua and Mango, which fruits are then in season. Then there is the 'Lamlam,' or hunting festival, at which the Kalo again officiates for the whole village. At all these festivals the 'Tharia' is the fashionable dance. In June each household offers its 'khidori' sacrifice. In September the 'Kalo' offers the 'kadoleta' sacrifice, at the cutting of the upland crops. At the 'Karam' festival, in September, the young people of both sexes offer sacrifices at the akhṛá, or dancing place. In October the 'Kalo' offers a sacrifice at the 'Kharra Púja,' of a brown khassi goat, and three cocks and one hen of different colours. The 'Bandai' festival is kept in October, and at this they dance the 'Jadura.' They dance, the 'Desaoli' in May and June and the 'Jadura' in October, November and December. In the months of February and September each household offers a sacrifice to its ancestors, who are supposed to act as guardian angels to their living relatives.

Demons.—It is the 'Kalo's' duty also to keep an eye on the various malignant spirits that haunt every Kharia village, and to propitiate them when necessary. The following are the most common of such evil spirits: The 'Pahto-Dubo' or horse demon. The 'Dorbo-Dubo' or elephant demon. The 'Gorea-Dubo' or fire demon. The 'Raksa-Dubo' has a man's body with big protruding teeth, and he carries a rod with a noose at the end of it, for catching people with, a big basket to put them into, and a hatchet to kill them with. He can only be appeased by the offering of a ram. Then comes the 'Gumi-Dubo,' whose proper sacrifice is a cow. When sacrificing to these demons, the priest kills the animal, whatever it may be, and runs away. The other evilly disposed spirits are the ghosts of women who have died while pregnant, called 'Churil-Dubos', and the ghosts of people who have met with violent deaths, called 'Jianth-Muahs.' These sometimes go about screaming or crying at night, and they inhabit large trees by the roadside, and pounce down on people who do not offer sacrifices. They frighten and sometimes kill the unfortunate wayfarer. The 'Pahariyá-Kharias' also personally offer sacrifices to the 'Baranda-Dubo' who lives in ant-hills. The sacrifice for this demon may be a buffalo, a ram, or a pig.

Good Spirits.—All the gods of the Kharias, however, are not evil. There are two great good spirits named Dhowlagir and Mainagir, and these have several spiritual apostles, who do their bidding. Three of the said apostles, known to my informant, were named 'Deogan-Guru,' 'Lugu-Guru,' and 'Mado-Mantri. Some 'Pahariyá-Kharias', known as 'Deonra-Lebus' or 'Motis', can invoke the above mentioned good spirits, but only for good purposes. The ceremony is as follows: The 'Deonra-Lebu' takes a 'samu' or bamboo fan, in which he puts some rice, and he places a small light in front of him. He then begins to rub his hand over the rice, and to invoke the good spirits with the following chant—

> "Come, come along, on the road I will make you sacrifices.
> "Here I stand, your priest, cause the sick man to be set free, and I will give you sacrifices.
> "Keep me (as your Deonra Lebu), and at the head of the waterfall I will make your sacrifices.
> "Make the sick man stand up, walk and work, and then will I give you sacrifices."

If the sick man recovers, the 'Deonra-Lebu' knows that Dhowlagir and Mainagir have granted his prayer, and he gives his sacrifices according to promise.

Witches.—But should the person die, and there be the slightest suspicion of the existence of a wizard or whitch in their midst, the Deonra-Lebu again calls the good spirits to his assistance, and sees the wizard's or witch's face in the light that is set before him. He then tells the 'Re,' or head of the village, who calls up all the villagers and explains the circumstances. The unfortunate wizard or witch is then turned out of the village, with much bad language and rough treatment. If any resistance is offered, the offensive person is beaten and sometimes killed outright.

Marriage customs.—'Pahariyá-Kharias' only marry when they come of age, and widows or divorcees are allowed to remarry. They may marry two or more wives, but very few ever do so. They must, however, only marry with other Pahariyá-Kharias, and the parties to the marriage must be of different 'gotors' or septs. The following are a few such septs, *viz.*, 'kiro' tiger, 'dungdung' eel, 'bilung' salt, 'baa' dhan, 'kerketa' a bird, 'soreng' stone, 'kulu' tortoise, &c. Pahariyá-Kharias have no 'dhamkuria' or bachelor's hall, but they have an 'akhṛá' or place for dancing. Marriages take place at the home of the bridegroom, outside of the house. The groom has to pay the girl's father a present, called 'gining.' This is not paid in money but in cattle. A fair price for a wife is two buffaloes, or seven heads of cattle. All friends and relatives are invited to the marriage feast. The bridesmaids anoint with oil the heads of both bride and bridegroom. The bridegroom then puts sindur on the forehead of his bride, and she returns the compliment. The best man then splashes them both with water, and the ceremony is complete. The happy couple are then carried about, by two strong men, to receive the congratulations of the company. After this the party sits down to eat and drink, and the rest of the night is spent by the young people in dancing, and by the elders in drinking. Next morning they all go and bathe together, in the nearest river or pond. When a man cannot afford to have a ceremonious marriage, he marries without ceremony, and this is called a 'dhuku' marriage. If married people cannot agree, they are at liberty to separate and to remarry with others if they choose.

Regarding children.—All property descends to male heirs. After child-birth the mother is considered unclean for six days, and during this time she must live and eat in a separate room by herself. The child is named when it is a month old. To find an auspicious name, grains of rice are thrown into a bowl of water, as each name is called, when all the grains come together at the bottom of the bowl, the last mentioned is the proper name. When boys reach the age of 8 or 10 years, they have their forearms burnt. Girls at about the same age are tattooed (by 'Malar' women) on their foreheads and temples, never elsewhere.

Regarding the dead.—The rich burn and the poor bury their dead. Dead people turn into ghosts, and these live chiefly near their burial-grounds. When a person is dying, all the ghosts in the neighbourhood get round his deathbed, and dance and make merry, for a new 'muah' or ghost is about to be born to them. People on the eve of death can see such ghosts, and then they know their time has come. The ghosts of people who die a natural death are quite happy, and do not molest the living.

The Sobors or Savaras.

History and traditional references.—The Savaras (a numerous section of the Kolarian race) are the southernmost of any of the aboriginal tribes who still speak a Kolarian language, and they have maintained their distinctive title from very ancient times. There is an inscription cut on the rock at Girnar in Gujerat from which we learn that Rudra Dáma (one of the Sah kings about 300 B. C.) conquered the Savaras and other wild tribes; and the Savaras are also referred to in the Puráṇas as a wild tribe in the south-east. Ptolemy mentions the Sabarae, and Pliny speaks of a tribe of Suari. Martin in his History and Antiquities of Eastern India, says that a large tribe of Siviras are traditionally reported to have existed and flourished in Sháhábád and Bihar contemporaneously with the Cheros, but there are none in those districts now. However Sherring in his "Tribes and Castes of India" states that a tribe of 'Seoris' who were in former times much mixed up with the Bhars, Cheros, Kols and Kharwars, were once established in Ghazípur and Mirzapur, and that a few are now to be found in Central India. "These people much resemble the Gipsies of Europe. Their women wear a tartan dress and often have a kind of horn projecting from the forehead as an ornament. They live in light and easily-moved booths made of grass and reeds, are fond of intoxicating drinks, and eat the flesh of swine and oxen. They procure wives for their young men by kidnapping female children, and live principally by jugglery, coining false money and theft."

Mythological and Historical references.—It is difficult to say whether these 'Seoris' are a branch of the Savaras of the south or not. A Mahábhárata legend says that the Savaras were created from the excrement of the wonder-working cow "Nandiní," which belonged to the hermit 'Vaśishṭha,' who employed them to punish a Kshattriya king named

" Viśva-Mittra " the son of Gadhi, king of Kanauj. From this legend it might be inferred that the Bráhmans employed an army of Savaras, (whom they imported from the south) as mercenary soldiers to fight on their side against the Rájpúts of Kanauj. These Savara soldiers would naturally leave their wives behind, and this would account for their almost total extinction, and for the necessity for their young men to procure wives from other tribes. The Cheros and Kharwars with whom the Savaras were associated are still very numerous and prolific in Mirzapur, Sirgúja, Palamu and other neighbouring districts.

Geographical Distribution.—In Sambalpur, Orissa and Ganjam the Savaras are found in various stages of civilisation and adopting various languages and customs according to their surroundings. In Ganjam they speak a mixture of the Kolarian and Dravidian languages and are known as Sonds, Sowras, Jara Savaras, Luda-Savaras, Arisa-Savaras and Tekkati-Savaras. In the Native States of Orissa and in parts of Sambalpur they speak dialects of Uríyá and are divided into the following sub-tribes, *viz.*,—

Divisions.—Sowras or Saondas, very hinduised cultivators. Taalas, very hinduised cultivators. Bentkars, hinduised, and weavers by trade. Ludhas, hinduised, and blacksmiths and ironsmiths by trade. Kella-Sobors or Potor-pinda-Sobor, the men are musicians and the women dancing-girls. It is said that in former times their women only wore leaves.

Sub-division of Sobors.—The purest representatives of the race call themselves Sobors, and speak a dialect of the Kolarian language which could be understood in Chuṭiyá Nágpur. These people are only to be found in the most jungly parts of the Native States of Orissa and Sambalpur, and a few are also found in Gangpur one of the southern tributary states of Chuṭiyá Nágpur, and the following notes only refer to these Sobors.

They are divided into three sub-tribes, *viz.*,—

1. Pardhea or Jara-Sobors are cultivators and shikaris. They, are sometimes known as ' Kurus.' They eat pigs, fowls, goats, fish &c., but not cows, buffaloes, tigers, lizards &c.

2. Potkota-Sobors, boat and string-makers and cultivators. They can eat the same animals as the Pardheas and also buffaloes, but cows are forbidden.

3. Bassu-Sobors are chiefly cultivators. They can eat the same as the Pardheas and also shell-fish.

These sub-tribes cannot intermarry or eat together, but they dance, drink and otherwise fraternize quite freely.

Septs and Totems.—They are divided into numerous septs of which the following are a few, *viz.*,—

Saram,	sambar	cannot eat.
Murmu,	nilgai	do.
Barhia,	wild pig	do.
Guincha,	tree mice	do.
Ir-tirki,	guinea-pig	do.
Nag,	cobra	cannot kill.
Sua,	parrot	cannot kill or eat.
Toro,	lizzard	do.
Hemrom,	a bird	do.

Pardhán, a title, the man who reinstates into caste.
Bisual, a title, the man who officiates at deaths.
Nega, a title, headman of a village.
Bhui or Bohi, those who carry palkis.

No two people of the same sept can intermarry. The wife belongs to the sept of her husband after marriage, and male and female children belong to the same sept as the father.

Religious Festivals.—The Sobors who retain their aboriginal customs have priests of their own tribe, who sacrifice goats, fowls, pigs &c at the village 'dimur' or spirit-grove. The head priest is called 'Turi' or 'Jhankor' and his assistant the 'Lengena,' and these offer sacrifices at the following festivals, *viz.*,—

Mágh-porob and Mágh-puni	in January.
Phagua, Phágun-pun and Gundi-Khia	in February.
Choit-porob and Choit-puni	in March.
Boiság porob	in April.
Jet-puni	in May.
Assar-porob or Dutia	in June.
Rakhi-puni and Pura	in July.
Nua-khia, Korma and Ekadasi	in August.
Tugilosa, Buriusa and Dalkhai	in September.
Kártik-puni, Bhaijinta, Pojinta Borousa Usa-borot, Kolasi-usa and Kola-Chusa	in October and November.
Pús-puni	in December.

Gods and Demons.—The head of every household is also supposed to sacrifice to numerous gods, of which the following are a few. Gorom-poti, village god. Bonera, hill god. Bons-poti, jungle god. Panch-konda and Peta-bulia, outside gods. Ludha and Ludni, Kandi-bent, Pagura-bent, and Pardhia-bent are household gods. Debí, Mahádeo, Mahábir, Bura-Bhim, Bhogia Bura-Deo are all great gods. Satbohoni and Jolkomoni are water nymphs, and the following are demons of sorts, Rakas, Bodru, Kalka, Rui bonga, Podmasini Temasini, Bhandargohoria, Churguri, Horli-pat and Kondra-pat.

Dances and Music.—Sobors have the following dances; *viz.*,—

Jadura	men and women together.	
Karma	do.	
Khedapar	do.	
Jatra	do.	
Kalanga	do.	
Biba	do.	at weddings.
Sudni	only women.	
Konkor	do.	
Kheldi	single woman of Kela Sobor tribe.	
Dond	danced by single man carrying bells on a stick.	

They use the following musical instruments: Lepur, Champ, Betbari. The Kela-Sobors use the Khonjini or Ghurka, a peculiar instrument which emits groans and grunts.

Wedding customs.—The uncivilised Sobors do not marry until grown up and the price of a wife is usually Rs. 5. Widows and divorcees can remarry, and a divorce is effected by returning the price paid for the wife. The marriage takes place at the man's house, and the bride is borne to the wedding on the backs of the bridesmaids. The bridegroom has to give a cloth to the bride, her mother and younger brother. At weddings Sobors do not dance the war-dance of Chuṭiyá Nágpur, but have a peculiar wedding dance of their own. The preparations for the wedding party are very much the same as in Chuṭiyá Nágpur.

Marriage customs.—They have the usual 'Mandua-tand.' Branches of 'Mahua' and 'Sargi' are planted on the altar, which consists of a four-cornered mound of earth, at each of the corners of which are placed water-pots with lights in them, a string being passed round the lot. The ceremony commences by the happy couple holding each other's little fingers and marching seven times round the 'Chounda' or altar, the woman going in front. The two being then seated together, the bridegroom puts a spot of 'sindur' on the bride's forehead with his right hand little finger, and she returns the compliment in exactly the same manner. The bridesmaids then draw near and tie the clothes of the pair together. After this they make the bride promise never to leave her husband, and (as it were to certify to the contract) put a big broad mark of 'sindur' on the bride, reaching from the crown of her head to the tip of her nose. The happy pair then retire into a house prepared for them, while the rest of the party sit down to dinner. After dinner dancing and drinking are commenced and usually carried on until next morning. Early in the morning the bridesmaids appear to wash the feet of the newly-married couple, the man receiving their attentions first. Sobors are permitted to marry as many wives as they choose, but do not usually have more than one.

Customs relating to children.—After childbirth the mother is considered unclean from six months to a year, and the husband has to live and eat apart from his wife, not even being allowed to drink water from her hands; and if there are no female relatives in the house, he has to do all the cooking. To effect a purification an official called 'Pardhán' has to give some drinking water first to the mother and then to the father, and finally to drink some himself, each one drinking out of his or her own hand. Just previous to this ceremeny the mother has to bathe. Before the purification, neither the father nor the mother can eat meat. After the purification they have a big dinner to which relatives and friends are invited. In Chuṭiyá Nágpur the 'Pardháns' are a sub-tribe of the Kheroars or Bhogtas. The Sobors do not usually burn 'sika' marks on the boy's fore-arms, as is customary amongst the aboriginal tribes of Chuṭiyá Nágpur. Girls are tattooed chiefly on the biceps. The Kol custom of tattooing on the forehead is practised by a few; but I noticed only old women with these marks, and I therefore presume the custom is dying out. The tattooing is done by the women of the Temna or brass-working caste. Amongst Sobors all property descends to male heirs only. The 'Dhamkuria' or bachelor's hall of Chuṭiyá Nágpur villages is not known amongst the Sobors. The Sobors usually bury their dead and put stones over the graves. The clothes, ornaments and sometimes the weapons of the deceased are buried with them. They believe in the existence of the spirits of the dead and also that they haunt their own homes; therefore at meals it is customary to put aside a pinch of food and some liquor to show the spirits they are not forgotten. Sobors are very superstitious; they believe in sorcery, and people suspected of practising the black art are hated, feared and often ill-treated. A grim sect of these people, known as 'Bisuals,' are the officials whose duty it is to offer sacrifices to the dead. They get paid for their services, and the office is hereditary, so that the Bisuals will doubtless become a sub-tribe in time, just as the Baigas have done amongst the aboriginal tribes in the Western Native States of Chuṭiyá Nágpur. The Bisual sacrifice consists of rice and the gum of the Sarai tree.

Language.—The following list of words shows where the Sobor and Saonda differ most from other Kolarian languages.

English.	*Sobor.*	*Saonda.*	*English.*	*Sobor.*	*Saonda.*
Ant	Juri	Bobo	When	Kote	Yenga
Boat	Dhondsa	Voda	Bad	Bogda	Sedele
Day	Angiana	Tamba	White	Telo	Palu
Where	Kon	Tenga	Small	Dihing	Doyina
Without	Guritke	Vodita	Thin	Pandra	Palapala som
Near	Hopora	Yuya	Hungry	Raing	Dolijan
Much	Birbarang	Bari	Be silent	Atupme	Kandang ama
What	Kate	Vongado	Hear	Anjom	Andangna

Há-shang-rgyal-po and Ug-ṭad, a Dialogue. From the Tibetan.

By Karl Marx, *Missionary at Leh, Ladakh.*

(Once upon a time) there was a king named Há-shang, who did naught but sin. (Now), had this king died, he would have gone to perdition; Chom-dan-das, however, had mercy upon him, and transformed himself into a minister called Ug-ṭad.[1] After he had come into the presence of the king and performed his obeisance, (the king) accepted him as his minister.

(It so happened, that) the king had two wives. Now, the king raised his second wife[2] to (the rank of) the first and gave her the golden crown. The first wife[3], being jealous, threw the Chhang[4]-cup at the king. The king resented this and gave the command to Ug-ṭad: 'Go and kill[5] this woman!' Ug-ṭad replied: 'It is not right to kill the queen for an offence so trifling.' The king (again) said: 'If you will not kill the queen, I shall kill you!'

Then Ug-ṭad conducted the queen to a grave-yard, and after having made her over to the care of the hobgoblins,[6] he made a sign to her meaning: 'don't be afraid,' and left her.

Thereupon he returned to the king. The king asked: 'Have (you) killed (her)?' The minister said: '(Yes, I) have killed (her).' 'Very well,' said he.

[1] ཨུག་སྟད་

[2] ཆུང་མ་

[3] ཆེན་མ་

[4] ཆང་ the beer of Ladakh and Tibet.

[5] 'Kill and come' སོད་ལུ་ཤོག་

[6] མི་མ་ཡིན་པ་

'Ug-ṭad,' the king (then) continued, 'your erudition is considerable, and your parts are good. (Tell me then): amongst acts performed by human beings, which are well (done)?'

The minister said: 'If you do not consider accomplishments of little account; (this is) well (done);

'if you do not look upon learning as being a fraud; (this is) well (done);

'if a rich man keeps his wealth under control,[1]' (this is) well (done);

'if a poor man curbs his tongue; (this is) well (done);

'if a women subdues (her own) body; (this is) well (done);

'if the Tsun-pa[2] fulfils the disciplinary statutes[3]; (this is) well (done);

'if the Ngags-pa[4] keeps the vows[5]; (this is) well (done);

'if the king can govern; (this is) well (done);

'if a man rises above bad report[6]; (this is) well (done);

'if a sick man conforms with the rules of diet[7]; (this is) well (done);

'if all (men) always were successful; (this would be) well;

'Brothers are good companions;

'one's own relatives make good governors;

'father and mother are dear to the heart;

'a wife is pleasant to give one food;

'a neighbour is nearer than a relative at a distance;

'on-foot is swifter than a weak horse;

'vegetables are sweeter than a porridge made of bad grain;

'there's more pleasure in being a spinster, than in having a husband with an evil countenance.'

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[1] In this and the following 8 sentences, the original always has ཐུབ་པ་ to be able, etc.

[2] བཙུན་པ་ Priest, Reverend.

[3] འདུལ་ཁྲིམས་

[4] སྔགས་པ་ Magician.

[5] དམ་ཚིག་

[6] Orig. ཡ་ག་ Jàschke, Dict s. v. ཡ་ཁ་ leaves the meaning, which is defined by Csoma as given in the text, still doubtful. In Ladakh the word is entirely unknown.

[7] Tibetan dietary rules forbid under circumstances meat (esp. of goats), sour milk, onions, chhang, anything sour, salt, vegetables, cold water, unless after its having been boiled previously; sleep during daytime is also strictly forbidden to any patient.

Upon this the king considered: "A wife is pleasant to give one food,' this is truly said; 'there is more pleasure in being a spinster, than in having a husband with an evil countenance,' is true likewise. Such has been said unto me. 'Again he thought:-' Ug-ṭad (probably) did not kill the queen,' so he said to Ug-ṭad; 'for the sake of one single offence, to command you: "kill the queen!" was not right; therefore, if the queen is not dead, I will make over my reign to you, (if) you go and bring[1] her (here).'

Ug-ṭad said: 'To raise a person from the dead, and to come and bring her (back), is a thing unheard of.'

The king said: 'Is there any means of bringing her to life again?'

Ug-ṭad said: 'None that I have. Had Your Majesty[2] not ordered me to kill her, I would not have dared to look at the queen [MS. with my eyes]; much less would I have dared to put her to death. If, for instance, you leave a[3] hatchet without a handle in an empty riverbed, then (surely) no wood will be cut. And I, just as little, have any means of bringing her to life again. I, too, was no party in her execution; it was Your Majesty,[4] who put her to death.'

The king said: 'As it seems evident, that the queen is not dead, bring her here[5]!'

Ug-ṭad said: 'She is dead. This is very much like the stories of the dove and of the hoopoe in times gone by.

'There once were two doves, a married couple, who, in autumn, hid some fine barley in a hole. In winter it dried up and grew less (in bulk). The husband (noticing this) said: 'Wife, thou hast eaten it!' and struck his wife with his bill and killed her. After spring had gone by, however, the hole was full again, and now the dove husband said: '(Indeed,) thou hast not eaten it, stand up!' But his wife being dead, a few maggots only came out.

'Also a hoopoe-couple once found seven peas. In order to eat (them some other time), they dug with their bills (in the ground) and hid (the peas) in the furrow. But the furrow closed up, and they could not find (the peas). (Then) the husband said: 'Thou hast eaten them!' and killed his wife. Next summer, for every pea one flower sprang up, and the hoopoe said: 'Last year's peas, all seven, this year have brought forth the flower Ha-lo, and now many peas will grow. So thou shouldest stand up! don't be long! arise!' But on lifting her up with his bill, a few maggots (only) came forth.

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[1] Orig. ཁྲིད་ལ་ཤོག་ bring and come.

[2] Orig. རྒྱལ་པོས་ the king.

[3] MS. adds སྒྲིང་པ་ ? i. e. སྣིངས་པ་ sharp, but its entire omission seems an improvement.

[4] རྒྱལ་པོ་ཉིད་ཀྱིས་

[5] ཁྲིད་ལ་ཤོག་

'Similarly, Your Majesty,[1] after having destroyed the queen, said (to me):' Ug-ṭad, you are (a) superior (person),[2] go and bring back[3] the queen!' But I say[4]: 'I never committed any mean offence[5], I never did a sinful act, I never took an unlawful wife, it was not I who killed the wife in question, and she being dead, there is no hope of her ever returning. (As it is), Your Majesty is (undoubtedly) my superior[6].'

The king said: 'Ug-ṭad, you should not tell falsehoods, but go and fetch (my) queen!'

Ug-ṭad said: 'Falsehoods there are many indeed:
'to say: there are five horses flying about, is a falsehood;
'to say: ants go to parched wheat, is a falsehood;
'to say: fish have their hearts in their heads, is a falsehood;
'to say: to a male a boy is born, is a falsehood.'

The king said: 'You are talking absurdities.'

Ug-ṭad said: 'Absurdities there are many indeed:
'(to say:) winter is naturally getting hot, is absurd;
'(to say:) summer is naturally getting cold, is absurd;
'to reject the advice of a loving friend and listen to the flatteries of an enemy who hates you, is very absurd.'

The king said again: 'You are a disgustingly foul (fellow)!'

Ug-ṭad said: 'Disgustingly foul there are many indeed:
'the archer's collar is foul;
'the tongue of a man digesting is foul.'

The king again said: 'You are hankering after disease!'

Ug-ṭad said: 'Hankering after disease, there are many indeed:

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[1] རྒྱལ་པོ་ 3rd, *i. e.*, 2nd person.

[2] ཁྱོད་ཆོད་ཆེ་བར་

[3] ཁྲིད་ལ་ཤོག་

[4] ཉག་སྨད་ན་རེ་ 3rd, *i. e.*, 1st person.

[5] ཆོད་ཆུང་བའི་ལས་ *i. e.*, a work of small dimensions.

[6] ཆོད་ང་བས་རྒྱལ་པོ་རང་ཆེའོ་

'if a man, not ill, takes drugs, he is fond of disease;

'if a sick man can't submit to régime, he is fond of disease;

'if in winter, a man puts on thin clothes, he is fond of disease;

'if in summer, a man sits down on damp ground, he is fond of disease.'

The king said: 'You want to destroy yourself!'

Ug-ṭad said: 'Wanting to destroy themselves, there are many indeed:

'one going to combat without armour, wants to destroy himself;

'one climbing a steep rock, wants to destroy himself;

'one crossing a raging torrent, wants to destroy himself.'

Again the king said: 'You wish to die.'

Ug-ṭad said: 'Wishing to die there are many indeed:

'one walking over a glacier in summer, wishes to die;

'one climbing a tree in winter, wishes to die;

'a fat sheep in autumn, running into a village, wishes to die;

'if a bad man is passionate, he wishes to die.'

Again the king said: 'You are in error!'

Ug-ṭad said: 'Erring there are many indeed:

'if a man does not guard himself against disease, he is erring, for there is a risk of his being attacked himself;

'if a man does not guard against cattle-disease, he is erring, for there is a risk of his own cattle-yard being made empty;

'if a man robs another man's wife from his bosom, he is erring, for there is a risk of himself being killed through the chastisements of the other;

'if a man takes oaths on things good and evil, he is erring, for there is a risk of his posterity being (suddenly) cut off;

'if a woman deserts her husband and makes love to another, she is erring.'

The king again said: 'Your power of speech is terrific.'

Ug-ṭad said: 'Terrific are many things indeed:

'the earth giving way, would terrify the hare;

'the heavens breaking down, would terrify the duck;

'the thing-ril[1] is terrified by the swamp drying up;

'the child,......[2] having come, is terrified.'

Again the king said: 'You can't keep within bounds!'

Ug-ṭad said: 'Immoderate are many indeed:

'if a poor man has become rich, he will be immoderate in boasting;

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[1] Name of a Tibetan bird not known.

[2] An omission in MS.

'if a bad companion has been indulging in slander, he (afterwards) will be immoderate in hypocrisy;

'if a vulgar person[1] has conceived a great hatred, he will be immoderate in the use of violent language.'

Again the king said: 'You are (one of those fellows saying:) if only I could, I would be glad.'

Ug-ṭad said: 'Glad if they could, there are many indeed:

'if one could (avert) the calamities connected with riches, one would be glad;

'if one could (command) the vigour of a country, one would be glad;

'if one could (endure) the talk[2] of a wife, one would be glad;

'if a champion could keep peace,[3] one would be glad.'

Again the king said: '(But) you are saying, I can't!'

Ug-ṭad said: 'Not able (to do a thing,) there are many indeed:

'one vanquished cannot boast;

'many (at once) cannot govern a country;

'a rich man has no control over his wealth;

'a poor man has no control over his stomach.'

The king again said: 'You don't know shame!'

Ug-ṭad said: 'Knowing no shame, there are many indeed:

'dress knows no shame; (still) there should be moderation in dress[4];

'sleep knows no shame; (still) there should be moderation in sleeping;

'the stomach knows no shame; (still) there should be moderation in eating;

'carnal desire[5] knows no shame; (still) there should be moderation in cohabitation[6].'

Again the king said: 'It is possible to prolong the queen's life!'

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[1] ཁ་དམན་ཅེས་ a low mouth.

[2] ཐོས་

[3] ཁྲོ་གས་མདུན་མ་ཐུབ་ན་—to མདུན་མ་ the meaning of treaty, peace is unhesitatingly and invariably given by my Tibetan assistants; the 'Ge-sar' (MS.) uses it frequently in the same sense, *e. g.*, 'a treaty of five years' duration,' in: ལོ་ལྔའི་མདུན་མ་ (བྱས་ནས་སོང་)—*i. e.*, keep, endure would be more accurate.

[4] It should be worn neither too long nor too short.

[5] འདོད་ཆགས་ cf. the use of the German Wollust.

[6] དེ་བྱས་ཚོད་ཡོད་ : 'having done it; enough.'

Ug-ṭad said: 'If it is possible to prolong the queen's life; what is to be done, if she is dead?

'(Still if you want) to prolong life, there are (means) many indeed:

'if (you) cure a sick man, (you) prolong (his) life;

'if (you) reconcile men quarrelling, (you) prolong (their) lives;

'if (you) give armour to men fighting, (you) prolong (their) lives;

'if (you) point out (to the stranger) the precipice and the water-course, (you) prolong (his) life.'

Again the king said: 'If it is true, that you killed the queen, then death would seem easy to me.'

Ug-ṭad said: 'Death seems easy to many indeed:

'if a man's family, elder and younger brothers, all have perished at the hands of men, death (seems) easy to him;

'if one has incurred the contempt of one's equals, death (seems) easy to him;

'if one is unable to fulfil one's obligations towards friends and relatives, death seems easy to him[1];

'if one's opponent in betting has left no pledge,[2] death seems easy.'

Again the king said: 'Although you never learnt all this,—how do you know it?'

Ug-ṭad said: 'Things known, though never learnt, such there are many indeed:

'weeping one knows, though one never learnt it;

'eating one knows, though one never learnt it;

'lust one knows, though one never learnt it;

'sin one knows, though one never learnt it.'

Again the king said: 'Although I was taught, yet I do not know it.'

Ug-ṭad said: 'Things taught, but not comprehended, there are many indeed:

'though you teach the lake where to go backward, yet it will not comprehend it;

'though you teach the glacier to float downhill, yet it will not comprehend it;

'though you teach the water (how to tie) a knot, yet it will not comprehend it;

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[1] གཉེན་གྲོགས་ཀྱི་ཁལ་འཁྱུད་མ་འཁྱེར་བས་རང་འཆི་བ་སླ། translation somewhat doubtful. The translation given in the text is in accordance with the explanation given by Tibetans.

[2] རྒྱལ་བཙོགས་པའི་དགྲ་ལ་ རྟགས་མ་བྱུང་བས་ translation as given is, I think, the one most appropriate.

'though you teach millet seed building, yet it will not comprehend it.'

Again the king said: 'That you should know all this, is most wonderful!'

Ug-ṭad said: 'Things most wonderful, there are many indeed:

'that the holy Chhos[1] should be preached and expressed in words, is a most wonderful thing;

'Sin renounced and virtue accomplished, is a most wonderful thing;

'Sitting idle and yet to complete (one's redemption) is a most wonderful thing;

'wealth and property heaped up and its crumbling away, is a most wonderful thing.

'Unseen and gracious Lha!
Unseen and terrible phantom[2]!
Untasted yet wished-for delight[3]!
Never partaken of, though sweet nectar!
Clouds undressed yet warm!
Bright sun and moon are without support!'

Upon this the king Há-shang, not knowing what else he should say, remained silent, and Ug-ṭad continued: 'Oh, great king! If you wish for elevation, attend to things that are low.

If you covet happiness, leave aside the causal connexion.
If you covet things near, traverse what is distant.
If you covet victory, put up with defeat.
If you covet wisdom, cultivate your mind.
If you covet Tsun-pa-ship, keep the ordinances.
If you wish for rest, feed your dog.
If you covet learning, leave the 'Chapter[4].'
If you want joy, do the Chhos.'

(Ug-ṭad) having said this, the king believed and asked: 'Ug-ṭad, how must the Chhos be done?'

The minister said: 'The Lama patron-saint[5] must be worshipped like a Lha. The vow must be held like one's own body. Hearing, thinking must be developed so as to equal the border of the heavens. Thoughts must be meditated upon like the oceans. 'Oh king! trust a loving friend! Cohabitation gives no satisfaction; hence do not allow carnal passion to gush forth like a torrent.

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[1] ཆོས་ doctrine

[2] འདྲེ་

[3] འདོད་ཆགས་

[4] ལེའུ་སྦྱངས་—ལེའུ་ = chapter, no doubt, refers to the ལེའུ་བདུན་མ་ 'seven chapters,' the most elementary book in Lamaistic religious literature.

[5] བླ་མ་ཡི་དམ་ Every one of the different Lamaistic sects professes adherence to one such patron saint; notably in Ld: the Sa-skya-pas to Tsan, m. (monastery at Ma-sho), the Ge-ldan-pas to Ḍol-ma, f. (monasteries at: Ṭikse, Spi-tuk, Sang-kar, Li-kir)

'Of spiteful enemies there will be no end; therefore do not allow hatred to burn like a fire.

'Though this be the period of dullness and error, do not allow ignorance to advance like darkness.

'There should be no talk of one's own attainments; hence do not allow pride to be born like a mountain.

'Other people's want being loss to one's self, do not allow envy to whirl like a cyclone.

'The doing of works never will cease; take up, then, the burden of suffering.

'Of worldly goods enough, is a thing unknown; cut asunder, therefore, the knot of avarice.

'There exists no measure to indicate the time of one's death; hence exert yourself to be pious.

'There is no telling, when death will draw nigh; therefore don't put off (striving after) virtue until the morrow.

'A small sin even is visited with a heavy penalty; therefore do not commit sin at all.

'All men at the first were equal; pay attention therefore to other people's dying and not dying.

'When another (person) dies, do not mourn at his corpse; thyself also must die.

'Nothing else is of use; seize hold of the Chhos, for it is of use in the end.'

The king believed and said: 'Father and mother, though searched never found! Fire and water, needful morn and even alike! Wife though absent, yet to be found!

Needful in the end is the holy Chhos!'

Ug-ṭad (again) said: 'If you of your own accord have come to believe in the Chhos, then body and intellect[1] both are annihilated by the mind.[2] These and the vanities[3] that are destroyed in the end, are

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the Ḍi-gung-pas to Ab-chi f. (monast. at: Sgang-ngon, Yu-ru, Shang.), the Ḍug-pas to Gon-po. m. (monast. at He-mis, Tchem-re, Stag-na.), the Rgyud-pas to Tsong-Kh-pa. m. (monast. at Ri-rdzong). All these patrons are said to have been great teachers and saints, either male or female.

[1] སེམས་ [2] བློ་ [3] ཀུན་རྟོག་

(all) illusions. If you know the inner sense,[1] then there remains nothing that could be called death. Virtue or vice, whatever has been done in times gone by, what kind of lives have been led, let their footsteps be your guides. Dear friend! do what is said in the holy doctrine.[2] Death being certain, do the holy Chhos. As there is no intelligence of our being exempt from death, be diligent and make haste. There is no profit in anything, but strain every nerve and seize hold of the Chhos. (The doctrine of) cause and effect[3] (in the moral world) being true, (accomplish[4]) virtue and renounce sin. Even at the risk of your life, don't throw aside the performance of the moral law. The state of metempsychosis causes weariness to the soul; having left behind the round of transmigrations and cast away suffering, happiness will spring forth.

'On love and compassion a loving heart for ever meditates.
'All—vanity and the inner sense, the two truths take to heart.'[5]

In such manner did (Ug-ṭad) teach (the king) many things. Thereafter in order to stablish him in the faith, he (sent word) to the queen, formerly hidden, (saying): 'The king — — — — — — — — — — —

Life of Atiśa (Dípaṃkara S'ríjñána).—*By* BÁBÚ SARAT CHANDRA DÁS, C. I. E.

Lha Lama Yes'e *hod*, king of Tibet, who held his court at Tholiṅ in Ṅah-ri was a devout Buddhist. He ruled peacefully over his country for many years. About the year 1025 A. D., he founded the monastery of Thoding at Tholiṅ (the lofty place). With a view to introduce pure and undefiled Buddhist monachism in Tibet, he selected seven intelligent lads, each ten years old, and carefully trained them up in Tibetan. Then, with the consent of their parents, he admitted them into the sacerdotal order. When these lads advanced in their study of the sacred books and became initiated in the practice of monastic discipline, he appointed two novice-monks (*S'ramaṇera*) to attend to each of them, and thereby increased the strength of his institution to twenty-one. Not satisfied with the Buddhist teachers of Tibet, whose cult had become greatly debased by the admixture of Tantrik and Pon mysticism, he sent these young monks to Kashmir, Magadha and other places of India where pure Buddhism still prevailed, with a view to their studying the philosophy of Ánanda Garbha of Kashmir and the code of monastic discipline. He commanded them to invite to Tibet, if possible, the renowned Kashmirian Pandit Ratna Vajra and Dharmapála (the Buddhist hierarch of Magadha) and other holy men whose acquaintance they might make during their sojourn in India. He also instructed them to ascertain if there were any other pandits who, when invited, would be useful to the cause of Buddhist reformation in Tibet. Accordingly they proceeded to India in search of knowledge and holy men, bidding a long farewell to their native country. Though the king succeeded in getting the services of thirteen Indian pandits, it is said, that out of the twenty-one monks whom he had sent to India, nineteen died there from heat, fever, snake-bite and other causes. Rinchhen *b*ssañpo, the great Lochâva, and Leg*s* pa*h*i S'erab were the only survivers who had the good luck of returning to Tibet crowned with success. They studied Sanskrit under some of the eminent Sanskrit scholars of India and acquired great proficiency in the Buddhist literature. Bearing in mind the instructions of their royal master, they visited Vikramaśilá to inquire of the S'ramaṇas if there was a saintly scholar in their midst who, when invited to Tibet, would be useful to the reformation of Buddhism. There they heard of Dípaṃkara S'ríjñána, whose spiritual attainments and learning were of a superior order, and who then occupied the first position among the Buddhist scholars of Magadha. They were also told that he was, in fact, the second *Sarvajña* of the school of 500 Arhats which is commonly called the *Mahásangika*. The Locbávas, however, did not venture to ask him to visit Tibet, being told that any such proposal would be premature at this time, if not absurd. On their return to Tibet they submitted an account of their experiences in India, and also of the condition of the Buddhist church of Magadha.

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[1] དོན་དམ་

[2] བསྟན་

[3] རྒྱུ་འབྲས

[4] MS. དགེ་བ་སྡིག་པ་སྤོང་ 'throw away both virtue and sin,' seems not to be in accord with the tenor of the previous exhortations; we prefer to insert སྒྲུབས་ fulfil.

[5] ཟུང་དུ་ཐག་

Greatly desirous of seeing the renowned sage of Magadha, the king commanded *R*gya-tson-gru señge, a native of Tag-tshal in Tsang to proceed to Vikramaśilá, taking with him one hundred attendants and a large quantity of gold. After encountering immense hardships and privations in the journey, the traveller reached Magadha. Arrived at Vikramaśilá, he presented to Dípaṃkara the king's letter with a large piece of bar gold as a present from his sovereign and begged him to honour his country with a visit. Hearing this, Dípaṃkara replied :—

"Then it seems to me that my going to Tibet would be due to two causes:—first, the desire of amassing gold, and second, the wish of gaining sainthood by the loving of others, but I must say that I have no necessity for gold nor any anxiety for the second." So saying he declined to accept the present. At this unexpected reply Gya-tson wept bitterly in his presence, wiping his tears with a corner of his sacerdotal robe. He explained to the sage that he was come from the country of Himavat thus far to Vikramaśilá, suffering immense privations, spending much treasure and suffering the loss of many of his companions who died of heat, fever, snake-bite and other causes in the journey, and at last he had to go back to his sovereign depressed at heart and disappointed in his hopes. Dípaṃkara sympathized with him and tried to console him.

On his return to Tibet the Locháva explained to his royal master the circumstances of the failure of his mission and returned the presents. Thinking that it was hopeless to bring Dípaṃkara to Tibet, the king again commanded the Locháva to proceed to Vikramaśilá to invite the scholar who was second to Dípaṃkara in learning and moral purity. At this time Nag-tsho, a young monk of Gung-thâñ, met Gya-tson and begged to be his pupil, but the Locháva desired him to wait till his return from Magadha. He proceeded to India with five attendants and a small quantity of gold, barely enough to meet the expenses of his journey to Vikramaśilá.

At the same time king Lha Lama started for the frontier for the purpose of collecting gold. When he arrived to the south of Purang, he was attacked by the troops of the Rájá of Garlog (Garwal ?) and made a prisoner. The Tibetan force that was despatched from Tholing by the king's sons failed to defeat the enemy, and Chañchhub *Hod*, his nephew opened negotiations with the Rájá of Garlog who agreed to release the king on two conditions:—that either the king became a vassal of his and embraced his creed, or that he paid a ransom consisting of solid gold of the size and shape of the captive king's person. The second condition being more agreeable to Lha Lama than the first, his two sons and nephew Chañchhub *Hod* sent officers to collect gold from their subjects in Tsang, U, Kham and the nine minor provinces called the Lin-gu. The gold that was collected and brought for ransoming the king did not satisfy the heretic Indian chief. It is said that when melted and cast to form a statue of the captive king, the gold fell short of the quantity that would be necessary to make its head. Seeing that it was impossible to satisfy the greed for gold of the Garlog Rájá and despairing of his release, Lha Lama advised his sons and nephew to make considerable religious offerings at Thoding and Lhasa and also to repair the monastery of Sam-ye for his moral benefit. He impressed in their minds the importance of inviting to Tibet a scholarly Indian pandit like Dípaṃkara for reforming the degenerate Buddhism of his country. But his sons and Chañchhub, being anxious for his release, went back to Tibet to collect more gold. In the meantime Lha Lama died in confinement.

When the news of Lha Lama's death reached Tholing, Chañchhub made religious offerings at Thoding and Lhasa, and, with a view to give effect to his royal uncle's long-cherished desire of life, charged Nagtsho Locháva of Guñ-thañ with the mission of going to Vikramaśilá in search of Gya-tson and also for inviting an Indian pandit to Tibet. Addressing the Locháva, he said :—"You know how degenerate the Buddhism of Tibet has become, how mixed are the religious practices here with the heretic cult of the red and blue robe Tantriks; the late king in his anxiety to reform our religion, thrice sent messengers to Magadha to bring the sage Dípaṃkara S'ríjñána to Tibet. Gya-tson-senge has not come back, and it is not known if he is still living. You are also aware of the calamities which befell my royal uncle, and that cost him his life. Go, therefore, to Vikramaśilá, if possible, again to invite the renowned sage of Magadha to our benighted country, but if he still declines to come, invite the pandit who is second to him in learning and holiness." At first, the young Locháva, who was only twenty-seven years old, hesitated to take so difficult a charge upon himself, but the king having insisted on his going to India, of which place he had some experience, he agreed, though very reluctantly, to proceed to Magadha. The king gave him leave to equip himself for the journey with one hundred attendants and to furnish him with a large quantity of gold, but the Locháva would take with him only four attendants and a small quantity of gold. On his arrival at Vikramaśilá he met with Gya-tson, who was then prosecuting his studies under one of the learned pandits of the grand monastery. With the help of Gya-tson, who had by his long residence at Vikramaśilá and other Buddhist places of Magadha, learnt much of the ways and manners of the people of Magadha, the young Locháva became introduced to the principal personages of Vikramaśilá. He resided in the monastery for some time as a pupil of the abbot Sthavira Ratnákara, and with his assistance he succeeded in inducing Dípaṃkara to visit Tibet.

Dípaṃkara was born A. D. 980 in the royal family of Gaur at Vikramanipur in Bangala, a country lying to the east of Vajrásana (Gayá). His father called *Dge-vahi dpal* in Tibetan, *i. e.*, "Kalyáṇa S'rí" and his mother Prabhávatí gave him the name of Chandragarbha, and sent him while very young to the sage Jetari-an *Avadhut* adept for his education Under Jetari he studied the five kinds of minor sciences, and thereby paved his way for the study of philosophy and religion.

Growing in age he acquired proficiency in the three *piṭakas* of the four classes of the Hínayána S'rávakas, in the Vaiśeshika philosophy, in the three *piṭakas* of the Maháyána doctrine, the high metaphysics of the Mádhyamíka and Yogáchárya schools and the four classes of Tantras. Having acquired the reputation of being a great pandit in the S'ástras of the Tírthikas which he studied till the twenty-fifth year of his age, he defeated a learned Bráhman in Logic. Then, preferring the practice of religion to the ease and pleasures of this world, he commenced the study of the meditative science of the Buddhists which consists of the Triśikshá or the three studies—morality, meditation and divine learning—, and for this purpose he went to the *vihára* of Kṛishṇagiri to receive his lessons from Rahula Gupta. Here he was given the secret name of Guhyajñâṇa Vajra, and initiated in the mysteries of esoteric Buddhism. At the age of nineteen he took the sacred vows from S'íla Rakshita the Mahásaṃgika Ácharya of Odantapurí who gave him the name of Dípaṃkara S'ríjñáṇa. At the age of thirty-one he was ordained in the highest order of Bhikshu and also given the vows of a Bodhisattva by Dharma Rakshita. He received lessons in metaphysics from several eminent Buddhist philosophers of Magadha. Lastly, reflecting on the theory of "the evolution of all matters from voidity" he acquired what is called the "far-seeing wisdom."

On account of these divers attainments which moved his mind variously in different directions, he resolved to go to Ácharya Chandrakírti the High Priest of Suvarṇadvípa Accordingly in the company of some merchants he embarked for Suvarṇadvípa in a large boat. The voyage was long and tedious, extending over thirteen months during which the travellers were overtaken by fearful storms. At this time Suvarṇadvípa was the head quarter of Buddhism in the East, and its High Priest was considered as the greatest scholar of his age. Dípaṃkara resided here for a period of twelve years in order to completely master the pure teachings of the Buddha of which the key was alone possessed by the High Priest. He returned to India accompanied by some merchants in a sailing vessel visiting Támradvípa and the island of forests on his way. Returning to Magadha he sought the company of eminent sages, such as S'ánti, Naropánta, Kuśala, Avadhuti Tombhi and others.

The Buddhists of Magadha now acknowledged him as their chief and unanimously declared him to be the "Dharmapála" or the hierarch of Magadha. During his residence at the shrine of Mahá Bodhi at Vajrásana he thrice defeated the Tírthika heretics in religious controversy, and thereby maintained the superiority of Buddhism over all other religions in Magadha. At the request of king Nyáya Pála he accepted the post of High Priest of Vikramaśilá. At this time Magadha was invaded by the king of Kárnya (probably Kánauj). Nyáya Pála's armies suffered several defeats at the hand of the enemies who advanced near the capital. The Magadha king sued for peace, and a treaty was signed by which friendship was established between the two kingdoms. In this treaty Dípaṃkara took an active part. It was he who reconciled the king of Kárnya to Nyáya Pála.

He visited Tibet in the year 1038 A. D., accompanied by his brother Víryachandra, Rájá Bhúmi-Saṃga, and Nag-tsho Locháva. The king of Tibet gave him a most cordial reception and commanded his people to receive his teachings with profound veneration. Finding that Dípaṃkara was the best and wisest of the Indian pandits whom he and his father had ever asked to visit Tibet, the king out of reverence for his deep learning and purity of morals gave him the name of Jovo Atíśa (the Supreme Lord who has surpassed all). Arrived at Tholing Dípaṃkara preached the profound doctrine of the Maháyána doctrine and wrote several works on the principles and cult of the general and esoteric branches of Buddhism among which Bodhipatha Pradípa is pre-eminent. In short he revived the practice of the pure Maháyána doctrine by shewing the right way to the ignorant and misguided Lamas of Tibet, who had all become Tantriks. He cleared the Buddhism of Tibet of its foreign and heretic elements which had completely tarnished it, and restored to it its former purity and splendour. Under his guidance the Lamas of Tibet discovered what is called the "real and sure path of the exalted excellence." After a residence of thirteen years which was distributed over the different parts of Tibet, during which he assiduously devoted himself to the propagation of pure Buddhism, enjoying uninterruptedly the good will and veneration of the people, Atíśa died at Ñethang near Lhasa at the age of seventy-three in the year 1053 A. D. He is remembered with deep veneration all over high Asia or wherever the Buddhism of Tibet prevails. He was the spiritual guide and teacher of *H*Bromton the founder of the first grand hierarchy of Tibet.

Dípaṃkara wrote several works and delivered upwards of one hundred discourses on the Maháyána Buddhism. The following names of his works occur in *m*do ཆི *of B*stan *h*gyur.

1. Bodhipatha pradípa.
   བྱང་ཆུབ་ལམ་གྱི་སྒྲོན་མ་
2. Charyá saṃgraha pradípa.
   སྤྱོད་པ་བསྡུས་པའི་སྒྲོན་མ་
3. Satya dvayávatára.
   བདེན་པ་གཉིས་ལ་འཇུག་པ་

4. Madhyamopadeśa.
དབུ་མའི་མན་ངག་

5. Sangraha-garbha.
སྙིང་པོ་བསྡུ་བ་

6. Hṛidaya niśchita.
སྙིང་པོ་ངེས་པར་བསྡུ་བ་

7. Bodhisattva maṇyávalí.
བྱང་ཆུབ་སེམས་དཔའི་ནོར་བུའི་ཕྲེང་བ་

8. Bodhisattva karmádimárgávatára.
བྱང་ཆུབ་སེམས་དཔའ་ལས་དང་པོ་བའི་ལམ་ལ་འཇུག་པ་

9. S'araṇágatádeśa.
སྐྱབས་སུ་འགྲོ་བ་བསྟན་པ་

10. Maháyánapatha sádhana varṇa saṃgraba.
ཐེག་པ་ཆེན་པོ་ལམ་གྱི་སྒྲུབ་ཐབས་ཡི་གེར་བསྡུས་བ་

11. Maháyánapatha sádhana saṃgraha.
ཐེག་པ་ཆེན་པོའི་ལམ་གྱི་སྒྲུབ་ཐབས་ཤིན་ཏུ་བསྡུས་པ་

12. Sútrártha samuchchayopadeśa.
མདོ་སྡེའི་དོན་ཀུན་ལས་བཏུས་པའི་མན་ངག་

13. Daśakuśala karma páda deśa.
མི་དགེ་བ་བཅུའི་ལས་ཀྱི་ལམ་བསྟན་པ་

14. Karma Vibhaṃga.
ལས་རྣམ་པར་འབྱེད་པ་

15. Samádhi sambhára parivarta.
ཏིང་ངེ་འཛིན་གྱི་ཚོགས་ཀྱི་ལེའུ་

16. Lokottaráṃgasaptaka vidhi.
འཇིག་རྟེན་ལས་འདས་པའི་ཡན་ལག་བདུན་པའི་ཆོ་ག་

17. Guru Kriyákrama.
བླ་མའི་བྱ་བའི་རིམ་པ་

18. Chittotpáda saṃvara vidhi krama.
སེམས་བསྐྱེད་པ་དང་སྡོམ་པའི་ཆོ་གའི་རིམ་པ་

19. S'ikshá samuchchaya ábhi samaya.
བསླབ་པ་ཀུན་ལས་བཏུས་པའི་མངོན་པར་རྟོགས་པ་

This was delivered by S'rí Dharmapála the king of Suvarṇadvípa to Dípaṃkara and Kamala.

20. Vimala ratna lekhana.
དྲི་མ་མེད་པའི་རིན་པོ་ཆེའི་སྤྲིན་ཡིག་

This last is an epistle addressed by Dípaṃkara to Nyáyapála, the king of Magadha.

Place and River-Names in the Darjíling District and Sikhim.—By L. A. WADDELL, M. B.

Facility for finding etymology of names in this area.—The manner in which place-names are assigned in Sikhim, Eastern Nepál and Western Bhotan, and also in Southern Tibet, can be ascertained with unusual facility and certainty by a local review of place-names in the Darjiling district, Native Sikhim and British Bhotan, owing to the great majority of the villages therein, having been founded within the present generation by migrant Sikhimites and Bhotiyas and immigrant Nepális and Tibetans, under the Government policy of quickly peopling these hitherto sparsely populated tracts; so that the reasons for the special nomenclature of such new sites and villages are still currently known by the villagers. And, the etymology of many of the river-names and older place-names can be more or less readily traced owing to the still existing-presence of the race of Lepchas—believed to be the autochthones of the area. The relative simplicity of the subsequent ethnic elements, all of which are still represented, also tends to simplify the problem.

Desirability of fixing the Lepcha etymology as the language is becoming extinct.—The present time, too, seems specially indicated for investigating this subject, from the fact that the Lepcha, though still a living language, is fast becoming extinct; and no vocabulary of the language having been published*, the names which the Lepcha race has given to the rivers and the mountains and other sites in Sikhim, although remaining as ethnological landmarks, might, through much longer delay, prove wholly unintelligible, through their meaning becoming lost.

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* Mr. Hodgson published (*Essays*, London reprint, 1874) a short list of Lepcha words, and several words are to be found scattered through Colonel Mainwaring's *Grammar of the Rong (Lepcha) Language*; but these are quite insufficient for the present enquiry.

In my attempt to fix the etymology of some of these Lepcha names, I have to confess to the difficulty of the task in the absence of any vocabulary; but I have spared no pains in the endeavour to trace the exact meaning of the various roots by the help of the few more-intelligent Lepchas available (of literate Lepchas there are now none), and by local enquiry at most of the several spots during the past two or three years.

Ethnic history of Sikhim.—A reference to the ethnic history of Sikhim itself is necessary in essaying the discovery of the system adopted by its inhabitants in naming places within its area. And first of all as to the limits and position of Sikhim.

Sikhim defined.—Sikhim forms a narrow oblong tract in the south-eastern Himalayas and sub-Himalayas, wedged in between Nepál on the west and Bhotan on the east, and bounded on the north by Tibet and on the south by the plains of Bengal. Its position is peculiarly isolated, it being separated from Nepál and Bhotan by high wall-like ridges, from Tibet by the snows, and from Bengal by the dreaded Tarai jungle.

Darjiling district defined.—The Darjíling District consists mainly of 'British Sikhim,' *i. e.*, the southern third of Sikhim, including the Sikhim Tarai (or Morang), the plains skirting the foot of the hills. To this tract was added, as a result of the Bhotan war of 1862, a slice of the hilly portion of western Bhotan from the Tísta eastwards: the remainder of 'British Bhotan' is the *tarai*-tract known as the 'Dwárs' and a strip of hill territory in the neighbourhood of the British frontier-posts of Buxa and Dewangiri, which for administrative purposes are included in the Jalpaiguri District and Asam.

The Lepchas.—As above stated, the Lepchas are believed to be the aborigines of Sikhim. Their own tradition, which, is very vague, credits them with having entered Sikhim about 500 years ago.* As, however, they preserve the tradition of a great local deluge,† it is probable that their entry was much earlier than this. The peculiarly isolated position of Sikhim and its inhospitable nature can account for its comparatively late occupation. The term 'Lepcha' is, like the current name for their country (*viz.* Sikhim), of Nepáli origin and uncertain meaning.* The Lepchas call themselves *Rong* which in their vernacular means a 'squatter' or 'care-taker,'† and the country they call '*Ne láyang*' or 'the country of caves,' *i. e.*, for shelter. By the Bhotiyas (Tibetans) they are called Möm-bô (Mon-pô) and Mö-ri (Mon-riks), *i. e.*, 'Inhabitants of the Mon Valleys' and 'Mon tribe'. The Lepchas seem to have preceded the Bhotan Bhotiyas in the *trans*-Tista (British Bhotan) portion of the Darjiling District, as most of the mountain and river-names there are of Lepcha origin.

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* Col. Mainwaring in *Introduction* to Grammar, p. x.

† This tradition is a somewhat circumstantial account of the flooding of the country by the Great Rangít river, quarrelling with its spouse the Tísta and refusing to go with her to the plains. The waters rose as high as 'Rangli Rangliot' (q. v.), *i. e.*, over 4000 feet above the present level of the river, and even Mt. Mainom the sister of Tendong was submerged, Tendong saving the inhabitants only by raising himself above the waters. The quarrel was ultimately mended and the pent-up waters fell. There are so many side-stories bearing on this great deluge, that it is almost certain that a great local flood actually happened here, by a vast landslip (volcanic or otherwise) damming up the waters for a time.

The 'Sikhim-Bhotiyas' or 'Sikhim-Tibetans.'—The next ethnic element was an influx of Tibetans from the Tsang province of Tibet immediately to the north of Sikhim. The date of this immigration is fairly well known—it occurred about 400 years ago.‡ These Tibetans promptly usurped the sovereignty and became the dominant race, and the present 'rájá' of Sikhim is about the 10th or 11th of this series of Tibetan chiefs. The routes by which they entered are still called '*the* great pass' (La-chhen), and '*the* short pass (La-chhung). Although they intermarried freely with the Lepchas and still do so to a considerable extent, they awarded them a very low social position; and so unfashionable and effete has the Lepcha race now become that the Lepchas seek self-effacement by intermarriage with Bhotiyas and Limbus, and so are fast contributing to the speedy extinction of their own race. These Tibetans of Sikhim are by the Nepális called Sikhim Bhotiyas. It is desirable here to define the terms 'Bhotiya' and Bhotan as they are frequently confused and misunderstood. The native name of Tibet is written *Bod* and pronounced *Pöṭ*. The Sanskrit form of this word was *Bhot*,§ and its inhabitants by all the Sanskritic speaking races of India are called *Bhotiya* (also written *Bhutiya*) which is synonymous with *Tibetan*—'Tibet,' the current European form, being believed to be merely the Persian or Tartar form of the same word *Pöṭ*.[*] The country generally known in India as Bhotan[†] was so called by the Bengalis in the belief that it was 'the end of Bhot,' which is the literal meaning of the full Sanskrit form of the word, *viz.*, 'Bhotánta.' The natives of Bhotan as well as of Tibet proper are also by Hindus called Bhotiyas as being inhabitants of Bhot. It is therefore to be remembered that the terms Bhotiya and Tibetan are synonymous, the various divisions being designated by prefixing the name of the country in which the Bhotiyas are now settled, *e. g.*, Sikhim-Bhotiya, Nepáli-Bhotiya, Bhotan or Dharma-Bhotiya, Tibetan and Chinese Bhotiyas.

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* The Nepalis pronounced the word 'Lapche' which is the true pronunciation. It is said to be a contemptuous term, and is possibly derived from the Parbatiyá *lab* + *che* = 'the vile speakers.' The Lepchas, unlike the Limbus and other neighbouring tribes of apparently cognate origin did not adopt the Parbatiyá language.

† And their explanation is, that they were originally given this country by God to take care of. It is unlikely that this name is derived from the Tibetan *rong*, 'a valley,' as the word does not seem exotic. It is probably related to their legend of Mount Ten-ḍong, *q. v.*

‡ Mainwaring, loc. cit., p. x.

§ Hodgson believes that the Tibetans derived the name of their country from the Sanskrit appellation through the early Indian Buddhist missionaries.—*The Language &c. of Nepal and Tibet*, p. 22. This, however, is doubtful.

The Limbus.—More peaceful intruders were the Limbus[‡] a Mongoloid race from the adjoining hills on the west. These like the Sikhim Bhotiyas intermarried, and still do so, to a considerable extent with the Lepchas. They, however, had a superior civilization and formed settled abodes. Latterly, they have generally given up Buddhism in favour of a rough form of Hinduism, and have adopted the dress and to a large extent the dialect (Parbatiyá) of the Nepáli highlanders.

The Nepális or 'Pahári yás.'[§]—These three tribes, *viz.*, the Lepchas,

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[*] E. Colebrone in *J. R. G. S.*, Vol. I, Supp., I, p. 98, says "A Tibetan arriving in Ta-chien-lu from Lhasa on being asked from what country he has come will often reply 'from Teu Peu', meaning from High or Upper Tibet. Perhaps Teu Peu is the source of our Tibet." The word should properly be spelt Tö-pöṭ, which fairly approximates to our '*Tibet.*' L. A. W.

[†] The natives and all Tibetans call this country 'Duk-pa' (*h*brug-pa) which literally means 'the thunderer,' evidently, it seems to me, on account of the unusual amount of thunder experienced here; as the mountains of the greater part of the tract receive the full force of the monsoon from the top of the Bay of Bengal. The Lamas on the other hand assert that the name is derived from the Duk-pa sect of Lama and implies the worship of the thunderbolt which is so peculiar to Bhotan Lamaism: the name of thunderbolt, however, is '*dorje*' not '*duk*,' and the name may more probably be merely a result of the worship of the (for Tibetans) striking and somewhat mystic natural phenomenon (thunder characteristic of this area. And this view is supported by the vernacular history of Bhotan—the 'Namtharkyi Nag-wang-ten-dsin Nam-gyal'—which translates the title '*h*brug-pa' (*i. e.* Dukpa) into Sanskrit as *megha-swara* or 'cloud-voice.'

[‡] So called by the Nepális; they call themselves *Yák-thumba* (or Yák-herds), and the Lepchas and Bhotiyas call them *Tshong* (which in the vernacular means 'a) merchant'; and the Limbus were and still are the chief cattle-merchants and butchers in Sikhim, and cattle was the chief form of exotic merchandise until the British occupation.)

[§] It is to be noted that the term '*Parbatiyá*', a Sanskritic word having an identical meaning, *viz.*, 'of or belonging to the hills', is in practice restricted to the *language*, a Hindí dialect spoken by the Paháriyás. And the title of *pahári yá* is confined to those hillmen only who profess Hinduism, and this usually of a most lax type.

Bhotiyas and Limbus, formed the population of Sikhim; and this simplicity of ethnic constitution remained undisturbed (except for a brief incursion of Ghorkhas about the beginning of the present century, the intruders, however, being soon expelled by the British) until the British occupation of Darjíling as a Sanitarium. This latter event, which took place in 1837 was speedily followed by a large addition to the population, consisting mainly of Nepáli or '*Paháriyá*' (Hindí for 'hill-man')* settlers from Eastern Nepal.† This great influx of Nepális during the past few decades, although comprising very numerous and distinct tribes, (*viz*., Newars, Kiranti, Murmi, Gurung, Mangar or Magar Khas &c., all more or less Mongoloid in type and until recently each speaking widely different dialects) is from a linguistic point of view practically homogenous, from the great majority of these tribes having adopted the Sanskritic 'Parbatiyá' dialect along with the Hindú ceremonial of their Gorkháli rulers.

The Bhotan Bhotiyas or Duk-pa.—The portion of Bhotan annexed to the Darjíling district in 1862 had previously contained only a very few settlements of Bhotan Bhotiyas (or '*Duk-pa*') and Lepchas. This tract being also thrown open to emigrants, a large portion was soon occupied by Nepális, and a not inconsiderable number of refugees from independent Bhotan, and a few Tibetan Bhotiyas or *Pö-pa.*

Simplicity of the linguistic elements.—Linguistically then, there may be considered to be, and to have been, only three generically distinct languages prevalent among the settled inhabitants of Sikhim and the Darjíling district, *viz*., the (1) Lepcha (or Rong-ring) with which may be included the Limbu dialect which seems structurally allied to it, (2) the Tibetan or Bhotiya, including its Sikhimite and Bhotan dialects, and (3) the Sanskritic dialect (Parbatiyá) of the Nepáli Pahárivas. All these linguistic elements are represented in the local names of the area here discussed; and in addition, in the Tarai is a slight Bengali (Sanskritic) element of recent introduction; and in the hill-tract are several English names designating settlements connected with colonization and British enterprise in the tea-industry, *e. g.*, Hope-town, Bloom-field, Bannock-burn, Birch-hill, &c., but too few to merit special notice.

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* So sparsely was Sikhim populated that Dr. Campbell estimated ('*The Oriental*' January, 1874, p. 13) that, at the British occupation of Darjíling, the population of Native Sikhim was not more than 5 to the square mile: in the proportion of Lepchas 3,000, Bhotiyas 2,000, and Limbus 2,000. While in the southern third of Sikhim forming the Darjíling Hill Tract the total population amounted only to about 100! In 1849 the population of the latter area had, by attracting settlers from Nepal, Sikhim and Bhotan, increased to about 10,000, and the Census of 1881 showed the population of the Darjíling district, including the added strip of Bhutan to the east of the Tísta, to amount to 155,645, and the 1891 Census brings the number over 200,000. The population is still increasing, and Native Sikhim also shares in this increase, although at a much less rapid rate.

† The Gorkhas, now the ruling race of Nepal, derive their name immediately from the town of Gorkha which is about 60 miles W. N. W. from Katmandu (Oldfield's '*Nipal*,' Vol. I), and which formed the first location of their Rájpút ancestors in the Himalayas; but this place-name is in its turn derived from the eponymous deity of the now royal family, *viz*., Gorakhanáth, who seems to be a form of S'iva (Cunningham's *Anc. Geog*., p. 165). Only a small proportion of the members of our so-called 'Gorkha' regiments are really Gorkhas, the majority are Mangar, Gurung, Kiranti, &c.

Plurality of Place-names.—The oldest names are found to be of Lepcha origin. The Lepchas from their wild forest life are 'born' naturalists, possessing a name for nearly every natural product, animal or vegetable, whether of economic value or not. Hence they readily gave discriminating names to the chief mountains, rivers and sites in their neighbourhood. A few of these old names still survive in places where the Lepchas no longer are present. The Bhotiyas, on settling in Sikhim, bestowed their own names on many of the already named sites, partly perhaps from the fact that the meaning of the Lepcha name was not evident, and partly to express their contempt for the Lepchas. Thus, many of the hills and rivers possess two names, *viz.*, a Lepcha name and a Bhotiya (Tibetan) name, *e. g*, the *Riot Ung* and *Rang-nyu Ung* of the Lepchas are the *Dik-chhu*, and *Tsang-chhu* of the Bhotiyas; and the *Kong-lô chu* and *Na-tam chu* of the Lepchas are called *Kang-chhen-dzö-nga* and *Kabur* by the Bhotiyas. And since the influx of Nepális a third synonym in the Parbatiyá dialect of Hindi has been added in several instances for rivers, mountains and already named sites, *e. g.*, *Tísta* and *Jalapahár* are the current Pahárivá names for the Lepcha *Rang-nyu Ung* and *Kang-gol hlo*; but such Nepáli synonyms usually are merely corruptions of the Lepcha or Bhotiya names, *e. g.*, the *Rá-dô* of the Lepchas, *Chumi-chhen* of the Tibetans and *Am-bi-ok* of the Bhotan Bhotiyas are corrupted by the Nepális into *Ladhoma*, *Simik chi* and *Ambek* respectively.

Orthography employed.—A few words here are necessary regarding the orthography employed. The current English forms (in maps &c.) of spelling geographical names in this area, as elsewhere, are usually most incorrect and unsystematic: the spelling and pronunciation disagree at every turn, and are out of keeping with the native form, which is the only true one. The system adopted in this paper is the precise method of Sir W. Jones as recognized by the Society, and now generally followed for philological purposes. To adapt it to the complicated vowel-sounds and semi-silent final consonants of the Tibetan, and the peculiarity that such words are not pronounced directly as they are spelt, the following modifications generally following De Körös' system have been introduced :—In transliteration all the words are fully spelt (and not as in Jäschke's method which seems to me too contracted and symbolic), and the silent letters are put in italics. Diacritical marks are only used in the alternative spelling which gives the pronunciation : the letter ô has an *aw* sound like the *aw* in *law* and *awful*, it literally represents the spelling in the written form ; the vowel sound é is as in French, and ö and ü are as in German ; a subscribed dot to a final consonant indicates that it is almost silent. The following Tibetan letters are transliterated thus :—

ཅ = ch. ཕ = ph. ང = ng.
ཆ = chh. ཚ = tsh. ཉ = ny.
ཐ = th. ཞ = zh. ན = n.

and the nasal *n* is represented as *ṅ*. The Lepcha words are spelt phonetically—their vowel sounds are so very complex and the language so decidedly *tonic* in character, that it is frequently almost impossible to express the exact sound in writing even by compound diphthongs.

Division of the names.—In detailing the etymologies of the local names it is convenient to arrange these in groups according to their Lepcha, Tibetan and Pahāriya origin ; and also to divide the place-names into names of mountains, passes, gompas (monasteries) and village or ordinary place-names.

THE RIVER-NAMES.

Of Lepcha origin, the majority.—In so mountainous countries as Sikhim and British Bhotan the rivers are very numerous. Most of the river-names in Sikhim proper are known only by their Lepcha names to both Bhotiyas, Pahāriyas and the English. The Lepchas have no special word for 'river,' but employ instead the word for water, *viz.*, *ung* in a variety of combinations. The Bhotiyas in adopting the Lepcha river-names substitute for the Lepcha suffix *ung*, the suffix *chhu* which has an identical meaning. While the Pahāriyas substitute *khola* (which in Parbatiyá literally signifies 'a valley') or *nadí* the ordinary Hindí name for rivers. Thus the *Rang-nyet ung* of the Lepchas is the *Rang-nyit chhu* of the Bhotiyas, the *Rang-gīt nadí* of the Pahāriyas and the *Rungeet river* of the English.

Lepcha River-names.

The majority of the Lepcha names for rivers contain the prefix *Rang* which conveys the sense of extension or length* and is to be met with in other words, *e. g.*, *Rang-gan* = a steep ascent, &c. The following are instances of river-names with this prefix.

RANG-NYET UNG = *Rang*, extended, + *nyet*, two + *ung*, water = 'the two extended waters.' There are two rivers of this name, *viz.*, the *Rang-nyet ung mo*, 'the mother, or greater Rangít' and the *Rang-nyet ung kap* or 'the young, or lesser Rangít,' and they form 'the two' principal rivers of Sikhim proper. (The *Tísta*, which is of course larger, arises beyond Sikhim).

RANG-FO UNG = *Rang* + *fo*, muddy brown + *ung* = 'the muddy brown extended water.' A rivulet arising in the reddish lateritic soil of the low outer hills, and tributary to the Tísta near Sivok.

RANG-ZO UNG = *Rang* + *zo*, precipitous or semi-vertical + *ung* = 'the precipitous river.' A torrent tributary of the Tísta.

RANG-RONG UNG = *Rang* + *rong*, splashing. A tributary of the Tísta in Sikhim descending throughout greater part of its length over boulders and precipices.

RANG-PO UNG = *Rang* + *po*, to shift or wander.

RANG-GLO UNG = *Rang* + *glo*, to fall.

RANG-GUḲ UNG = *Rang* + *guḳ*, narrow and constricted.

RANG-NOṆ-UNG = *Rang* + *noṇ*, to go straight.

RANG-FOK UNG = *Rang* + *fok*, to be incised deeply.

RANG-NYU UNG = *Rang* + *nyu* = queen, 'the queen river' as it—the Tísta—is the Spouse of the great Rangít. *Nyu* is also said to be a contraction for *nang-yü*, *i. e.*, 'straight-going.' Where the Tísta receives the Great Rangit, the chief river of Sikhim, which joins it at a right angle, the Tísta continues in its straight unaltered course, its direction being unaffected by this great accession of waters, hence is attributed its Lepcha name. It is more likely, however, that it is so-called on account of its straight arrow-like course *after leaving the hills*, in contradistinction to the other great effluent river of Sikhim (the *Mahaldi*) which means '*the bent* moving water'. Another possible derivation is from *a-nyung* = deep; the Tísta being the deepest river in Sikhim and always unfordable.

Other river names containing this prefix are Rang-bi (= *bik*, to tear asunder), Rang-mo, Rang-li and Rang-fap, &c.

A few of the rivers share the prefix *ra* in common:—

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* Another possible, though not very probable, derivation is from *Dang* = to run, *i. e.*, + *ung* = running waters; *d* is frequently converted into *r* by the Lepchas —but this particular word in the colloquial is not subject to such change.

Ra-thong ung = *Ra*, surging and tumultuous advance, + *thong*, to swallow or drink up. The main source of the Rangít, and a glacier-fed rapid torrent subject to sudden and destructive flood.

Ra-dô ung = *Ra*, (as above) + *dô*, a lake. The river arises from a small lake called '*Kala pokh'rí*', or the black lake' by the Nepális and *Ung-Dô* by the Lepchas.

Ra-mith ung = *Ra* + *mith*, dust or grit. Arises in the lower slopes below Birch Hill and is turbid.

Ra-mom ung (*Pahariya* 'Ra-mám') = Ra + (?) *Mong*, a demon, the name of the lake—*Mong-dô*—whence this river rises, beyond Phallut. (As an alternative derivation *mom* = incomplete, somewhat, in the sense of the Latin *sub*).

Other rivers are named :—

Ro-lo ung = *Rol*, tortuous.

Rí-lí-ung = *Ril*, to revolve or turn round.

Rí-rí ung = *Rí-rí*, swift or rapid.

Rí-yot ung = *Rí*, rapid + *yot*, let loose, or unlimited. An extremely rapid river called by the Bhotiyas the *Dik-chhu* (q. v.).

Rí-shí ung = *Rí*, + ? *shiap*, whirling. A rapid mountain torrent.

Re-ing ung ('Raing' of map) = *Re-ing*, to spread out, or be shallow. A shallow and broadish rivulet in the outer hills near Sivok.

Ma-hal-dí ung (corrupted by Bengalis and Paháriyas into '*Mahanadí*' or '*Mahananda*') = *Má-hal*, bent or curved + *dí* to move. This river, as seen from the hills, takes a very sudden bent to the right on reaching the plains; and seems so-called in contrast to the *Rang-nyu Ung*, *i. e.*, 'the straight river,' the Lepcha name for the other great effluent river of Sikhim, *viz.*, 'the Tísta'.

Bhotiya River-names.

The Sikhim-Bhotiyas exhibit much poverty of invention in naming their rivers. When not directly borrowing the Lepcha name, which is the rule, they usually name the stream after the mountain whence it arises, or after the chief village or pass near which it flows. For example :—

La-chhen chhu = ལ་ la, a pass + ཆེན་ chhen, great + ཆུ་ chhu, water: 'the water of the great pass.'

La-chhung chhu = la + ཆུང་ chhung, small + chhu: 'the water of the small pass.'

Rí-tse chhu = Rí-tse, the name of the hill + chhu.

Rong-li chhu = Rong-lí, a Lepcha's house + chhu. At the ford or bridge over this river was encountered the first Lepcha's house on the way from Tibet.

As a result of this loose style of nomenclature, the same river possesses different names at different parts of its course, *e. g.*, the Lachhung is called the 'Yum-thang chhu' and 'Mome chhu' opposite these two villages.

Exceptions to this practice are had in the following amongst others :—

DIK-CHHU = དིག་ dig (pr. *tik* or *dik*), staggering or reeling + chhu. A snow-fed stream which in a rocky bed descends about 10,000 feet in a course of about twelve miles.

RÍ-ZE CHHU (*Ang.* Rishi) རི་ rí a mountain + གཟར་ *gzar* (*pr.* zé) a torrent. A mountain torrent crossed on the way from Tibet.

TSÁNG-CHHU = གཙང་ *g*tsang, pure + chhu : 'the pure water'—the Bhotiya name of the Tísta, deriving the name from its property possessed in common with all large rivers of tending to become quickly *purified* from defilement.

LE-TÍ CHHU = སླེ་ *s*le, to twist or plait + འཁྲིབ་ *h*khri*b* (*pr.* tí), to twist or coil.

RO-RO CHHU = རོག་རོག་ roḳ-roḳ, black or gloomy.

LAKES are neither large nor numerous in this area, but such as do exist have usually mythological names and are believed to be the spouses of the hills in the neighbourhood. A small lake on Lebong Spur which was filled up last year in preparing the Station polo-ground was called *Me-long tshô* or 'the mirror-lake'. Another lake valley is called *Chhu loṇk-yo*, said to mean 'a spoon of water'.

Nepáli (*Parbatiyá*) *River-names.*

The Pahàriyas have accepted the Lepcha and Bhotiya names for the rivers within the hills, but have usually contorted these names by mispronunciation to an almost unrecognizable extent: *e. g.*, the 'Ra-dô' and the 'Kale' of the Lepchas have become the Ladhoma and Kulhait of the Pahàriyas.

The small hill streamlets are called by them *jhorá* from the *Skt.* झर, *jhara*, a cascade or water-fall, from the root *jha*, to waste. These *jhoras* are individualized by being named after the adjoining village, or the special use they are put to, *e. g.*, *Dhobi-jhora* (*H.* धोबी *dhobí*, a washerman) = 'the washerman's stream'; *Kák jhora* (*H.* काक *kák* a crow) 'the crow's brook', near the municipality rubbish-heap at Darjiling, where crows and kites congregate. When a hill-stream is subject to very sudden and violent outbursts, it is called *Paglá jhora* (*H.* पगला, *paglá* insane or mad) 'the mad stream,' on account of its furious and erratic behaviour.

As regards the effluent rivers which debouch on the plains, the Pahárias have accepted the current Bengali names for these, *viz.* :—

Tísta. The Sanskrit form of the name is *Tri-srota* (*Skt.* त्रि + स्रोत) = 'the three currents.' The Tísta, until the year 1787 A. D., when it suddenly forsook its old bed and opened for itself a new channel, on emerging from the hills divided into three portions named the Atrai, the Púrṇabhadra and the Karotoya rivers, which each followed independent courses to the Ganges and the Brahmaputra respectively. The name is of very old application, being mentioned as the *Tri-srota* in the Puráṇas; and as this name well described its leading physical feature in the plains, and under the Prákrit rules the *r* of compound consonants is dropped in ordinary speech, thus forming 'Tísota' or 'Tísta'—this seems to be its true etymology. An alternative etymology might be suggested, *viz.*, *Skt.* त्रष्ट, *tṛishṭa* = 'harshly sounding'; but in the deltaic portion of its course this is not a character of its slow-flowing waters, and the literate Bengalis had no access to its course within the hills.

Mahananda. This is the Bengali corruption of the Lepcha name *Mahal-dí*, which name, as already shown, describes the most obvious feature of this river suddenly *bending* away to the right. The letters *l* and *n* are always interchangeable in speech, but after having made this interchange, as no plausible interpretation could be put on such a word, the Bengalis, and following them the Paháriyas, usually pronounce it '*Mahánadí*,' *i. e.*, 'the great river,' although its size does not warrant such a title.

Bálasan or **Bálason** is the Bengali name for the plains-portion of the Rishi Chhu of the Sikhimites. It is believed to be derived from the Bengali वालि, *báli* (*H.* bálu) sand, + सोन, *sona*, gold, with reference to its extensive bed of yellowish sand.

Mech or **Minch**, the remaining *morang* (tarai) river (excepting the Chenga) is said to be so named from being the western boundary of the tribe, called by Bengalis *Mech* and by themselves *Bodo*—the semi-aborigines of the *morang*.

THE MOUNTAIN-NAMES.

The mountain names are mainly of Lepcha and Bhotiya origin. The names of the snow-clad peaks are almost wholly Bhotiya (Tibetan); as the Lepchas affect the lower levels and the valleys; while the Bhotiyas usually keep to the cooler heights, and were brought into constant relation with the higher peaks and passes in their commercial and religious intercourse with transnivean Tibet. The Pahâriyas have no name for the individual snow-peaks, but call them collectively '*Himâl*' from *Skt.* हिम *hima* snow, + आलय *âlaya*, house = 'abode of snow;' or '*Dhaula giri*, *Skt.* धवल, + गिरि 'white mountain' (= 'Mont Blanc.')

Lepcha names of Mountains.

Shin-shel hlo (*Ang.* Senchul) = *Shin*, cloud and mist-enveloped + *shel*, to be wet or dank + *hlo*, a mountain = 'the damp misty hill.' This mountain overlooking the plains receives the full force of the monsoon and is cloud-capped for the greater part of the year, so as to have been abandoned as a military site for the very qualities designated by its Lepcha name.

Ma-hal-di ram = *Mahaldí*, name of river above described, + *ram*, the source or fountain-head = 'the head of the Mahaldi' river.

Sa-thong hlo (*Ang.* Sitong) = *Sa-thong*, a tiger + *hlo*, a hill = 'tiger-hill.' A hill near Kursiong overlooking the tarai and still frequented by tigers.

Kung-gol hlo, the Lepcha name for Jalapahar = *Kung*, a tree + *gol*, fallen or upset. The appearance from above is that of a prostrate tree: Birch Hill and Lebong Spurs being the main branches, and the smaller spurs the branchlets.

Fok-lut (*Ang.* Phallut) = *Foḳ* to be excoriated or denuded + *lut*, an elevation or peak. This peak is so called on account of its top being bare of forest (being above the limit of trees), giving the appearance of being stripped or peeled of forest.

Sing-le hlo (*Ang.* Singlelah) = *Sing-le*, a kind of alpine Alder (*Alnus vel Betula*, sp.). A steep mountain on the Nepal frontier beyond Phallut crowned by Alder trees.

Tun-ḍong or **Tün-rong** (*Ang.* Tendong) = *Tün*, to heap or raise up + *rong*, a horn; also *Tung rong*, = a ladder. A sub-conical mountain, which tradition asserts arose *like a horn* from amid a local deluge, and so enabled the Lepchas to escape being drowned. Their tribal name of *Rong* may perhaps be associated with this legend.

Ma-nom (*Ang.* Mainom) = *Ma*, mother + *nom*. sister. 'The elder sister' of Tenḍong.

Sa-bar kam (*Ang.* Subarkum) = *Sa-bar*, the musk-deer, + *kam*, an overhanging rock. Formerly a favourite haunt of musk-deer, between Sandukfu and Phallut.

KONG-LÔ CHU = *Kong*, highest or pre-eminent + *lô*, a screen or curtain + *chu*, snow and rocky mountain : 'the highest curtain of the snows.' The Lepcha name for Kangchhen-dsö-nga (*Ang.* Kanchinjunga) which is worshipped as a god.

NAN-TAM CHU = *Nan*, level + *tam* cut away, truncated (also *tám* a plain) + *chu*. The Lepcha name for Kabru or Kabar: describing the peculiar truncated appearance of that mountain as seen from the greater part of Sikhim proper.

PAN-DIM CHU = *Pan-dim*, a king's minister (derived from *pa-no* a king). A high sub-conical peak, which is considered to be an attendant on the god 'Kanchinjunga.'

TA-SING BLÜ = *Tasing*, ? ...... + *blü*, a ridge.

Bhotiya Mountain-names.

KANG-CHHEN DSÖ-NGA (*Ang.* Kanchinjunga) = གངས་ gang*s*, snow + ཆེན་ chhen, great + མཛོད་*m*dso*d*, a repository or ledge + ལྔ་ *l*nga, five = 'the five repositories of the great snows,' referring to the 5 peaks of this, the second highest mountain in the world, which is an object of worship to both Bhotiyas and Lepchas.

FYUM-GANG = *Fyum* a kind of bambu (*Thamnocalamus*, sp.) + སྒང་ *s*gang, a ridge. Hooker noted* the appropriateness of this name.

CHUMO-HLA-RI = ཇོ་མོ་ jomo, a lady + ལྷ་ hla, god + རི་ ri, a mountain = 'the goddess mountain.'

KANG-CHHEN GYAO (*Ang.* Kanchinjow) = Kang-chhen + རྒྱ་བོ་ *r*gya-wo, *pr.* gya-o, bearded, with reference to its monster icicles.

SAN-DUK-PHU. This is interpreted by Lama Ugyen Gyatsho, whom I consulted regarding several of the Tibetan names, as བསམ་ *b*sam, meditation + གྲུབ་ grup, to obtain + ཕུ་ phu, a height = 'the height or cave on which wishes by meditation will be obtained.' This mountain, however, is not called 'Samdup-phu,' nor has it reputed sanctity or any sacred spot. I believe that the name is derived from རྩ་ *r*tsa, a plant + དུག dug, poison + phu = 'the height of the poison plant.' Here aconite and poisonous rhododendron are so abundant that all the sheep and cattle are muzzled while crossing this mountain; and it is a peculiarity of the Sikhim and Tsang dialect of Tibetan that a final *n* is frequently introduced as an affix to the first syllable

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[*] *Him. Journ.* II, p. 198.

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where absent in the written Tibetan*; thus *tsa-duk* becomes *tsan-duk*.

NAR-SENG = སྣ་ *s*na, a nose + སེང་ seng uplifted. 'The uplifted nose,' descriptive of the appearance of the mountain as seen from lower Sikhim.

FA-LI-LUNG = ཕལི་ pha-li, a large shield + རླུང་ lung, wind = 'the shield of the winds.' This high ridge tends to shield lower Sikhim from the S. W. monsoon.

RÍ-NAK (*Ang.* Rhenock) = རི་ rí, a hill + ནག nag, black. The soil of this hill is a very black humus.

RÍ-TSE (*Ang.* Rishi) = རི་ rí + རྩེ་ *r*tse, summit = 'the hill top;' the path leads over the top of the hill.

CHHORTEN-GANG = *m*chhoḍ *r*ten, a chaitya + *s*gang = 'the chaitya ridge.'

PÖ-GA GANG = *Pö-ga*, the sal tree + *s*gang = 'the ridge of sal trees'.

RÍ-SUM = རི་ rí + གསུམ་ *g*sum, three = 'the three hills'; at this site three ridges unite.

RÍ-ZHAP (*Ang.* Rishap) = རི་ rí + ཞབས་ zhap*s*, a foot = a site at foot of the Himalayas.

LUNG-THU (*Ang.* Lingtu) = ལུང་ lung, a mountainous valley + ཐུར་ thu*r*, a steep descent. This mountain presents an unusually steep descent to the valleys. Many of the Bhotiyas call this hill *Lung-tong* ལུང་སྟོང་, *i. e.*, 'the deserted mountain valley.'

PANG-KA-SHA-RI (*Ang.* Pankhasari) = སྤང་ *s*pang, pasture + ཀ་ཤ་ ka-sha, a kind of grass + ri. '*ka-sha* pasture-land.'

DÁ-LING = མདའ་ *m*dah, an arrow + *g*ling. A subconical (arrow-head like) hill. Formerly a strong frontier fort of the Bhotanese.

BAR-NYA (*Ang.* Barmi) = འབར་ *h*bar, burned + གཉའ་ *g*nyah, a neck: 'the burned saddle or spur'.

Paháriyá Mountain-Names.

The Paháriyás generally accept the Lepcha and Bhotiya mountain-names. Amongst the exceptions are the following :—

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* Examples of this in Sikhimite are :—*min-da*, a gun, for the Tibetan me-dah.
min-tok, a flower ,, ,, me-tok,
mingo, not wanted ,, ,, mi-go.
gyám, fat ,, ,, gyaḳ.

And in Tsang-pa dialect of Tibetan an *n* is frequently inserted where the following syllable has, as in this case, an initial *d*; *e. g.* :—

gan-do (= good) spelt *dga-bde*.
tshan-do (= hot) ,, tsha-*h*de.

JALA PAHÁR = H. *Jala*, burned + *pahár*, a hill. 'The burned hill.' This accounts in part for the presently bare condition of this hill.

GÍDHA PAHÁR = H. *Gídh*, a vulture + *pahár*. 'The vulture's hill.' Here great numbers of vultures infest the rocky cliffs overlooking the plains.

THE PASS NAMES.

The names of the mountain passes are all of Tibetan origin. The term ལ་ *la*, or pass is often loosely applied to the mountain itself. The following list comprises most of the passes :—

DONG-KHYA LA (*Ang.* Donkia) = འབྲོང་ *h*brong (*pr.* ḍong), the wild yak + ཁྱགས་ khya*gs*, frozen + ལ་ la = 'the frozen yak pass.' A herd of wild yaks, in attempting to spend the night in this pass (18,100 feet high), were frozen to death.

SÍ-BU LA = སིལ་བུ་ si*l*-bu, cold. 'The cold pass'—the greater part of the way is under snow.

THANG-KAR LA (*Ang.* Tanka) = ཐང་ thang, a field + དཀར་ *d*kar, white. This pass presents a field-like expanse of snow, all the year round.

JO-LA (*Ang.* Chola) = ཇོ་, lord. 'The lordly pass,' said to be so called on account of its height and difficult approach. An alternative etymology is མཚོ་ *m*tsho, a lake. Numerous lakes are in this pass.

YÁK LA = གཡག་ *g*yag, the yak (*Bos grunniens*). The pass for herds of yaks into eastern Sikhim.

YUM-TSHO LA = ཡུམ་, yum respectful title for 'mother' + *m*tsho. 'The lake of our (holy) mother,'—a nymph who is worshipped here.

RÍ-SHIḲ LA (*Ang.* Rishi) = rí, mountain + shiḳ, slipping or falling. The pass has appearance of a landslip.

YÁK CHHÖ LA = yak + གཆོར་ *g*chhor, tired. A steep pass—a stage for '*tired*' laden yaks proceeding above Lachhung.

DSE-LEP (*Ang.* Jelep) = མཛེ་, lovely + ལེབ་, level. 'The lovely level pass', with reference to its ease and patency.

NAK-PO or NA-KO LA = ནག་པོ་ nagpo, black. An unsnowed pass.

KU-PHU (*Ang.* Kupup) = སྐུ་ *s*ku, the body especially of a saint + phu, a summit. Tradition relates that the saint Guru Rimbochhe (*Padma Sambhava*) rested here, in passing to Tibet.

Tuk-la (*Ang.* Tukola) = གཏུག་ *gtug*, to tear or pluck off. Tradition states that the Pass was created by Guru Rimbochhe tearing off a portion of the rock to hurl at a demon who infested a lake in the vicinity to the annoyance of passengers.

Dü-la = བདུད་ *bdud* (*pr.* dü) a demon. 'The devil's pass'.

Ku-chak la (*Ang.* Quiche) is said to be derived from *ku* a lock, or *kug* crooked = 'the locked pass.' It is a difficult snow-locked pass.

Rô-bang la (*Ang.* Rabong) = རོ་ rô, a carcase + བང་ bang, a grave. In the pass is an old *mendong* grave-cairn.

La-chhen = la + chhen, '*the* great pass.' The longest pass into Sikhim from the Tsang province of Tibet.

La-chhung = la + ཆུང་ chhung, small. '*The* short pass' from Tsang into Sikhim.

NAMES OF GÖMPAS OR MONASTERIES.

Sikhim having derived its Buddhism and civilization from Tibet, its monasteries mostly bear Tibetan names and these usually of an ideal or mystic nature. The word དགོན་པ་ *dgon-pa*, pronounced *gömpa* literally means 'a hermitage,' and the oldest monasteries were, and many of them (*e. g.*, Dub-de, Sang-nga-chhö-ling, Pema-yang-tse, &c.,) still are situated in solitary places; but around some of the others, villages have gradually sprung up, and those of the most recent ones have been founded within villages from which they take their name, which in such cases is usually of Lepcha origin, *e. g.*, Ram-tek, Ling-tâm.

Dub-de = སྒྲུབ་ *sgrub* (*pr.* 'ḍub,') a hermit's cell + སྡེ་ *sde*, a place. 'The place of the hermit's cell'—the oldest monastery in Sikhim founded by the pioneer missionary Hla-tsün Chhen-bo.

Sang-nga-chhö-ling (*Ang.* Sangachiling) གསང་ *gsang*, secret or occult, + སྔགས་ *sngags*, spell or magic + ཆོས་ chho*s* religion + གླིང་ *gling*, a place. 'The place of the occult mystic religion.' A catholic Buddhist monastery open to all classes, including deformed persons, nuns, Lepchas and Limbus.

Pema-yang-tse (*Ang.* Pemiongchi) = པད་ padma (*pr.* 'péma') a lotus + ཡང་ yang, perfect or pure + རྩེ་ *rtse*, the highest 'the monastery of the sublime perfect lotus (-born one, *i. e.*, *Padma Sambhava*).' A monastery open only to pure, celibate,* and undeformed monks (= Tasang) and especially associated with Guru Rimbochhe who is worshipped here.

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* This condition is now satisfied by disallowing the residence of priests' wives within the precincts of the monastic establishment.

TA-KA TÂSHI-DING (*Ang.* Tashiding) = བྲག་ brag (= tag,) a rock + དཀར་ *d*kaṛ, white + བཀྲ་ཤིས་ *b*kra-shi*s* (*pr.* tá-shi) glory + ལྡིང་ *l*ding, a soaring up or elevation. 'The gömpa of the elevated glorious white rock.' The site, a bold high promontory at the junction of and between the Great Rangit and Ratong rivers, is believed to have been miraculously raised up by Guru Rimbochhe, and amongst other traces a broad longitudinal white streak in the rock is pointed out as being the shadow of that saint.

PHO-DANG (*Ang.* Fadung) = ཕོ་ལྡང་ pho-*l*dang, a sloping ridge; such is the site of this gömpa and the usual spelling of the name. As, however, this is the 'chapel-royal' of the rájá, it seems possible that the name may be ཕོ་བྲང་, pho-ḍang = palace, 'the gömpa of the palace.'

LA-BRANG (La-brang) = བླ་ bla, a contraction of *lama* or high-priest + བྲང brang, a dwelling. Here is the chief monk's dwelling. *N. B.*—This is one of the very few words in which *br* is literally pronounced as spelt.

DORJE-LING (*Ang.* Darjeeling) = རྡོ་རྗེ་ *r*dô-rje 'the precious stone' or ecclesiastical sceptre, emblematic of the thunder-bolt of Sekra (Indra or Jupiter) + གླིང་ *g*ling, a place. The monastery from which Darjíling takes its name, and the ruins of which are still visible on Observatory hill, was a branch of the Dorjeling, usually curtailed into Dô-ling (*Ang.* Dalling) monastery in native Sikhim; and to distinguish it from its parent monastery, it was termed *Wang-dü* Dorje-ling (དབང་ *d*wang, power + བདུས་ *b*du*s*, accumulated or concentrated) on account of its excellent situation, and powerful possibilities.

DE-THÁNG = *De*, a kind of tree (*Daphne papyraceae*, Wal.) from the bark of which ropes and paper are made + ཐང་ thang, a meadow = 'the gömpa of the *De* meadow.' Here these trees are abundant.

RÍ-GÖN (*Ang.* Ringim) = rí + དགོན་ *d*gon, a hermitage = 'the hermitage hill.' It is situated near the top of the hill.

TÔ-LUNG = རྡོ་ *r*do, a stone + ལུང་ lung, a valley. This valley is remarkably rocky, and avalanches of stones are constantly falling in showers.

EN-CHE = དབེན་ *d*wen, (*pr.* en), a solitary place + ལྕེ་ *l*che, a tongue. A monastery on a tongue-shaped spur.

PHE'N-ZANG = ཕན་ phan, bliss or profit + བཟང་ *bzang*, excellent. The monastery of 'excellent bliss.'

KHA-CHÖ-PAL-RI (*Ang.* Ketsuperi) = མཁའ་ *m*khah, heaven + སྤྱོད་ *s*pyo*d* (*pr.* chö) to accomplish or reach + དཔལ་ *d*pal, noble + ri = the monastery of 'the noble mountain of the Garuḍa (a messenger of the gods)' or 'of reaching heaven.'

MÁ-NI = མ་ཎི་ má-ṇí, a tablet inscribed with 'Om máni &c.,' a mendong. 'The gömpa of the mendong': here the gömpa was erected near an old mendong.

SE-NÖN = *Se*, a sloping ridge + ནོན་ nön, depressed. Situation on a depressed sloping ridge. It is also spelt *gzigs* (*pr.* sî) seer or beholder, + མནོན་ *m*nön, to suppress; and in this regard it is alleged that here Padma Sambhava beheld the local demons underneath and kept them under.

YANG-GANG = ཡང་ yang, perfect, also lucky + སྒང་ *s*gang, a ridge. 'The monastery of the lucky ridge.'

LHÜN-TSE = ལྷུན་ lhun, lofty + རྩེ་ *r*tse, summit. 'The monastery of the lofty summit.'

NAM-TSE = རྣམ་ *r*nam, a division or district + *r*tse. 'Lofty division' one of the subdivisions of Native Sikhim, on the flank of Tendong. It is probable that this is a Lepcha name from *tsü* = 'Seat of Government,' as the site is a very old Lepcha one.

TSÜN-THÁNG (*Ang.* Cheungtham) = བཙུན་ *b*tsun, a queen; also 'respected one,' *i. e.*, a lama or monk; also marriage + ཐང་ thang, a meadow. This gömpa is situated overlooking a meadow at the junction of the Lachhen and Lachhung rivers. It may mean 'the meadow of marriage (of the two rivers),' or 'the meadow of the lamas,' or 'the meadow of the lady'—its full name as found in manuscript being བཙུན་མོ་རིན་ཆེན་ཐང་ '*b*tsun-mo rin-chhen thang,' implies that the lamas would have the monastery derive its name from 'the precious Lady-(pig)' whose image is prominently displayed within the gömpa.

RAB-LING (*Ang.* Rawling) = རབ་ rab, excellent or high + *g*ling, a place. This monastery is situated on a high cliffy ridge.

NUB-LING (*Ang.* Nobling) = ནུབ་ nub, the west + *g*ling = 'The gömpa of the western place or country.' It lies on the western border of Sikhim.

DE-KYI-LING (*Ang.* Dikiling) བདེ་ སྐྱིད་ *b*de-*s*kyi*d*, happiness +

gling = 'The place of happiness.' It is a rich arable site with extensive marwa cultivation.

RIN-CHHEN-PUNG (*Ang.* Ringkingpung) = rin-chhen, precious + pung, a heap or knoll, 'The precious knoll.' The soil is rich and fertile.

For names of other monasteries see under the heading of Village-names.

VILLAGE AND OTHER PLACE-NAMES.

Lepcha Place-names.

When the place-name indicates the site of a village the suffix *kyung* or *kyong* = 'village,' is added; and for a site without any existing village *lay-ang* = 'a place or tract' is added.

ALI-BONG (*Ang.* Lebong spur) = *a-li* a tongue + *a-bong*, mouth. A *tongue*-like spur of land below Darjiling.

PA-DÁM-TAM (*Ang.* Badamtam) = *Pa-dam*, a large species of bambu (*Dendrocalamus Hamiltonii, N. et A.*) from which water-vessels ('*chongas*') and marwa jugs '*pa-hip*' are made: it grows only below 4,000 feet + *tám*, a contraction for *par-tám*, a level spot. 'The *padam*-bambu bank:' here formerly was a forest, the nearest to Darjiling, of this kind of bambu which is in much demand.

YOKRI-BONG = *Yokri*, India-rubber tree (*Ficus elastica*) here abundant + *bong*, (= Tibetan གཞི་) a stump or foundation, hence also a residential site. A village founded among (the stumps of felled or simply among) 'rubber' trees.

KANKI-BONG = *Kankí*, the 'padma' tree (*Prunus puddum*, Roxb.) here abundant + *bong*.

KUNG-BONG = *Kung*, a (any) tree + *bong*.

KOL-BONG = *Kol*, a walnut tree, here abundant + *bong*.

PO-BONG = *Po*, a large kind of bambu + *bong*.

NAK-GRÍ (*Ang.* Nágri) = *Nak*, straight + *grí*, a high stockaded fort.

TUNG-SUNG = a stockade.

NAM-FOK = fat + hollow, 'the fat hollow.'

NAM-TSÜ (*Ang.* 'Namchi') = *Nam* fat + *tsü*, Government. 'The Government of the fat site.'

PA-ZOK (*Ang.* 'Pashok') = 'jungle.' Here the dense sub-tropical 'jungle' or forest of the Tísta valley commences.

SANA-DA (*Ang.* 'Sonadah') = *Sana*, a bear + *da*, a lair = 'the bear's lair.' Bears are still in the neighbourhood.

TSONG-KYUNG = *Tsong*, the Limbu tribe + *kyung*, a village. A village founded and still mainly inhabited by Limbus.

RANG-MUK = *Rang* + *muk*, weeds. An old extensive clearing, now a tea-garden.

RANG-LOT (*Ang* Rangliot) = *Rang* + *lot*, to return. This is the limit from which the Rangít flood waters returned.

MAHI-MAN-DAP = *Mahi*, (a corruption of Bengali মহিষ, *mahish*, a buffalo, + *man*, flesh + *dap* to obtain. A site of a market overlooking the tarai, to which buffaloes were brought up from Bengal and slaughtered for retail of their flesh.

TAK-VÔR (*Ang.* 'Tukvar') = *Tak*, a hook-thread + *vôr*, a fish hook: the land is curved somewhat like this, and the local Lepcha tradition asserts this origin for the name.

SHING-TÁM = *Shing*, a garden + *tám*, a level spot.

SONG-KHANI = *Song*, copper, + *khâni*, Hindí and Parbatiyá for a mine. A village where copper ore is mined.

GOK = narrow and difficult (of access): an old military post on a narrow promontory between the Great and Little Rangít and Ramam rivers.

RONG-LÍ = *Rong*, Lepcha + *lí*, a house.

JING-HLÁM or ZHING-HLÁM = *zhing*, weak, or poor soil + *hlam*, sloping. 'The sterile slope.' The soil of this locality has a sterile reputation.

SALLO-KUNG = *Sallo*, name of a kind of tree + *kung*, tree.

UNG-LAP = *Ung*, water + *lap*, a well. Here is a well, a most unusual feature in Lepcha villages, where the usual water-supply is from brooks.

KALÖN-PONG (*Ang.* 'Kalimpong') = *Ká-lön*, a king's minister (a term borrowed from the Tibetan + *pong*, a stockade. This was formerly the stockaded headquarters of a Kalön.

SU-VOK (*Ang.* 'Sivok') = *sü* or *sü-e*, a breeze or rush of cool air + *vok*, concentrated. The mouth of the gorge whence the Tísta debouches into plains, and along which a strong breeze is ever present.

TSONG-TONG (*Ang.* 'Chongtong') = ? *Tsong*, an arrow + *tong*, a resting place. An arrow-head-shaped site at junction of two rivers, at an acute angle.

LONG-SONG = *Long*, a stone + *song*, resounding. A rocky site in the resounding gorge of Tísta opposite junction with Great Rangít.

PA-KYONG = *Pa*, a kind of cane + *kyong*, village.

LING-TÁM = *Ling*, a slope, or hill side + *tám*, level spot. A mixture of slope and level.

TING-KAP = *Ting*, a plain + *kap*, little. An unusually (for Sikhim) large meadow.

RAB-DEN-TSI = *Rap*, a collection + *a-den*, highest sect of Lepchas + *tsü*, law or government. This was the original seat of the Lepcha *pa-no* (rájá) before the influx of the Tibetan Barfungmos.

PAYONG-KANG = *Payong*, a species of bambu (*Cephalostachyum capitatum*, Munro) from which arrows are made + *kang*, a ridge.

PASHEN-BONG = *Pashen*, a tree-fern (*Alsophila latebrosa*, Hk.) + *bong*. Tree-ferns are here numerous.

SILIM (*Ang.* Selim) = a kind of tree (*Terminalia chebula*, Retz.) abundant at this site, the seeds of which are eaten.

SUM (Soom) = a tree (*Phyllanthus emblica*, Roxb.) the fruit of which is eaten.

SIRIM-PUNG = *Sirim*, Limbu name for a species of wild *citrus* + *pung* the Limbu form of *bong*.

HANG-MÁ-FUNG = *Hang-má*, Limbu name for a kind of tree with perfumed flowers + *fung*, a flower.

RAM-TEK = *Ram*, god + *tek*, gone. Local tradition states that the name was given to the site last occupied by their (Lepcha) chief on his deposition by the Bhotiyas, to express their misfortune.

YUK-SAM = *Yuk*, 'a superior' hence a *lama* + *sam*, three. The place of meeting of 'the three lamas' to choose a rájá for the Lepchas.

BHOTIYA PLACE-NAMES.

GANG-THOK (*Ang.* Guntok) = སྒང་ *s*gang, a ridge + ཐོག་ thok, a peak, an eminence. 'The eminent ridge.'

KAR-THOK = *d*kar, white + thok, 'The white eminence.'

YANG-THÁNG = གཡང་ *g*yang, a precipice + thang, a field, 'the field of the precipice.'—A huge cliff overhangs this meadow-site.

ZAM-DANG (*Ang.* Samdong) = ཟམ zam, a bridge + འབྲང་ *h*b*r*ang, a halting place, stage or dwelling.

MO-ME = solitary, a site (*circa* 16,000 feet) at the last bridge below the Donkya pass.

NA-THÁNG (*Ang.* Gnatong) = nak, black (or nag*s*, forest) + thang. 'The black meadow,'—the first meadow on this side of the Jelep pass; it is black with pines.

LHÁ-BA (*Ang.* Labah) = ལྷགས་པ་ lha*ks*-pa, windy. A breezy site.

OJAK-KHA (*Ang.* Iche) = འོ་ O, the previous name of the village + ཇག་ཁ་ jag-kha, broken. So called after the road had been cut through it, dividing it into two parts.

CHHUM-NAGA, = chhum, water + naga, a grassy bank.

NAK-TSHAL (*Ang.* Naxal) = ནགས་ nag*s*, forest + ཚལ་ tshal, a hunting grove.

BAR-FUNG = འབར་ *h*bar, burned, + སྤུང་ phung, a collection or heap or knoll. 'The collection of burned sites or jungle clearings.' The oldest Bhotiya division in Sikhim.

AM-BI-OK = *am-bi*, a demon's shrine + འོག་ og, below. A site below the shrine.

DAM-THÁNG = གྲམ་ gram (*pr.* ḍam) mud + thang, a marshy muddy meadow.

BÁ-KHYIM = *ba*, a kind of bambu used for making mats + ཁྱིམ་ khyim, a house. A house of bambu matting—a halting stage on Tendong hill.

MING-MACHHEN = *Ming-ma*, a kind of bambu + *chhen*, large.

SEDONG-CHHEN = *Sedong*, name of a tree (*Albizzia*, sp.) + *chhen*, large. Here a halting stage for travellers at a large Sedong tree, an uncommon tree in Sikhim.

PHA-DOM CHHEN = *phá-dom*, a clearing + *chhen*. A largish clearing in jungle forming a halting place.

DÔ-LEP-CHHEN = *r*do, a stone + ལེབ་ leb, level or flat + *chhen*. A halting stage at 'a big flat stone.'

CHHUM-MIK CHHEN = *chhu-mik*, a spring + *chhen*, big. Here is a large spring.

KYO-SHING (*Ang.* Keuzing) = *Kyo* wheat + *shing*, field. 'The wheat field.'

TONG-TÖ = སྟོང་ *s*tong, a valley + སྟོད་ *s*tod, upper. A division of Sikhim comprising an upper valley.

PÖ-DANG (*Ang.* Pedong) = *pö* or *pö-ga*, a kind of cypress, also a *Sal* tree, of the gum of which incense is made + འབྲང་ *h*brang, (*pr.* ḍang) a halting-place. 'The halting-place at the Pö tree.'

PA-ZAM-KHA (*Ang.* Buxa) = སྤ་ *s*pa, cane + ཟམ་ zam, a bridge + ཁ་ kha, mouth. Name of a site at 'the mouth of the cane-bridge' leading into Bhutan.

PAHÁRIYÁ AND BENGALI PLACE-NAMES.

(P = Paháriyá, B = Bengali and H = Hindí.)

LAPCHE-JAGAT = P. *Lapche* the Lepcha + *jagat*, a toll-bar. A village on the Nepal frontier where the Lepchas levied toll on the Nepáli imports into Sikhim.

SUNGRI-TÁNR = P. *Sungar*, a pig + *táṇr*, a jungle clearing. A halting stage of the Nepáli pig-drivers on their way to Sikhim.

SING-BUNG DERA = *Sing-bung*, Limbu for tree-stump + *dera* P. and Hindustání for camp. A wood-cutter's camp.

CHILAUNI = P. *Chilauni*, a kind of tree with perfumed blossoms (*Schima Wallichii*) ; here abundant.

KAINJALIA = P. *Kainjal*, a kind of tree (*Bischoffia Javanica*, Bl.) ; here abundant.

TAKTÁ-BÁS = P. तक्ता *taktá*, a plank + बास *bás*, a habitation. A wood-cutter's village in jungle where planks were stored for transit to Darjiling.

CHÚṆA-BATÍ = P. चूण *chuṇa*, lime + बाती *báti*, a lamp. A lime-kiln is here.

CHAILÁ-DURA = P. *chailá*, blocks of fire-wood + *dura*, a hut. A settlement of cutters of fire-wood.

BHOTIYA-BASTI = Bhotiya + बस्ती *bastí*, a residence. The Bhotiyas' village.

BÁTÁSI = P. बातासी *bátási*, windy. A breezy site.

SHEPI = P. षेपि *shepi*, to be wet or moist. A new village in a forest clearing where unusually dense dew falls.

MÁṬÍ-GHARA = P. माटी *máṭí*, mud + घर *ghara*, a house. The first mud-house met with at the foot of the hills (the houses in the hills being built of stone or wood).

NÚṆA-MÁṬÍ = P. नूण *nuṇa*, salt + *máṭí*, earth. Here is a 'salt-lick.'

CHETE-DHÁRA = P. *cheten*, a Buddhist *chaitya* + धार, *dhára*, a ridge. Here on the ridge is a chaitya.

GUMTI = P. a turn of the road. Site in the angle of a turn of the road.

PUL-BÁZÁR = Hindust. *pul*, a bridge + P. and H. बाजार *bázár*, a permanent market. A market at bridge over Little Rangit.

JOR-POKHRÍ = P. जोड़ *joṛ*, a pair + पोखरी *pokhrí*, a small pond. Here are two small ponds.

SUKHÁ-POKHRÍ = P. सूखा, *sukhá*, dry + *pokhrí*. A small semi-dry pond.

KÁLÁ-POKHRÍ P. = काला, *kálá*, black + *pokhrí*. A small pond with dark peaty water.

BAHMAN-POKHRÍ = B. Bahman, a Bráhman + *pokhrí* = 'The Bráhman's tank.'

JOR-BANGALÁ = P. *jor*, a pair + *bangalá*, the Bangala (Bengali) style of a European's house. Formerly there were only 'two bungalows' here.

LAMBÁ-DHARA = P. लम्बा *lambá*, long + *dhara*. Here a long ridge.

LÁMÁ-GAON = *Lámá*, superior monk + गाँव *gáṇw*, a village. Formerly a lama's residence.

Sipáhí-dura (*Ang.* Sepoy-dura) = *Sipáhí*, a native soldier + P. *dura.* The 'lines' of the pioneer Sepoys now disbanded.

Kuá-pání = P. कुआ, *kuá*, a well + पानी *pání*, water. No stream near, hence villagers had to dig a well, an unusual source of water-supply in the hills.

Goru-báthán = P. गोरु *goru*, a cow + बाथान, *báthán*, from Skt. बस *bas* to dwell + *sthán*, a place. A grazing station.

Símana = P. सीमन, *símana*, a boundary. A village on the Nepal frontier line.

Pání-gháṭa = P. *pání*, water, + घाट *gháṭa*, a ferry or ford. The ford over Balasan at foot of hills.

Páthar-gháṭa = H. पाथर *páthar*, a stone + *gháṭa*, a ferry. The ferry on the Mahananda where stones are gathered for road-metal.

Sili-gurí = P. and Skt. शिल, a stone + P. *guri* from Skt. गढ़ी *gaṛhí*, a small fort. 'The stone fort.' The furthest out site from the hills where stones are locally available for building.

Tarái = P. and H. तराइ, *tarái*, a swamp, or marshy tract.

Tariyana (*Ang.* Tirihana) = a form of above.

Dwár (*Ang.* Dwar) H. B. and Skt. द्वार *dwár*, a door, or passage. 'The door or entry (to the hills).' The broad shallow valleys leading from plains into the hills.

Kamán, the ordinary name used among the hill-coolies for tea-gardens. It seems to be the *Parbatiyá* word meaning 'to earn money,' from the same root as the H. कमाना *kamáná* 'to work for hire.'

Sanyási-thán = Sanyási, a religious mendicant + B. थान *thán*, 'the place, usually a shrine. Here it is a Sanyási's hut.

Dawái-pání = B. and H. *dawái* medicinal + *pání* = 'Mineral spring.' Here is a chalybeate spring.

Bágh-dokrá = B. बाघ *bágh*, a tiger + *dokrá*, roaring. A village in the Tarái in a locality infested by tigers.

Bairágí-bhíta = B. and H. *Bairágí*, a religious mendicant + *bhíta*, a plot of land. 'The mendicant's plot.'

Dángar-bhíta = B. and H. *Dángar*, a hill-man + *bhíta*. Here a settlement of some Uraon hill-men.

Háthí-ḍúba = H. and B. *háthí*, an elephant + डूब *ḍúba*, to immerse. A marshy tract which elephants could not cross.

Rájá-jhar = H. and B. *Rájá* + झाड़ *jhar*, a jungle. 'The king's forest.'

Ghorá-márá = H. and B. घोड़ा *ghorá*, a horse + *márá*, killed. A local tradition states that a horse was killed here by a tiger.

Bhaiṇsí-mári = H. and B. भैंस *baiṇsa*, a buffalo + मारि *mári*, killing.

MAHISH-MÁRI = B. महिष, *mahish*, buffalo + *mári*.

GÁI-BÁRÍ (*Ang.* Gayabári) *gáe* or *gái*, cow + बाड़ी *bári*, a habitation = cow-shed.

SÁL-BÁRÍ = B. and H. *sál*, the valuable timber tree (*Shorea robusta*) + *bárí* = 'The *Sal*-grove.'

ÁLU—, ÁM—, CHAMPA—, KAMLÁ—, PHUL-BÁRÍ = B. and H. *álu*, a yam or potatoe, *ám*, mango, *champa*, the champak-tree, *kamlá* (the citron) tree, *phul*, a flower + *bárí*, a habitation—hence as regards vegetables, a grove or garden.

SUKNÁ = B. सुकना *sukná*, dry. A dry site in Tarái on plateau at base of a spur where water-level is relatively low.

THE GENERAL IMPORT OR MEANING OF THE NAMES.

The above lists of names with their etymological definitions, although not exhaustive, suffice to show the manner in which place and river-names are assigned in this area. The great majority of the names are given by illiterate persons, so that grammatical accuracy is not always to be expected. The names, as to their meaning, may be generally classed as descriptive; a few are mythological and religious, but these are chiefly confined to monastery names; and the personal designations perpetuating the names of the founders of villages are found almost exclusively amongst the Pahāriyá settlements.

Names mostly descriptive.—The descriptive names predominate, and these usually well express some very obvious physical feature of the site or river, *e. g.*, of rivers, an especial tortuosity, steepness, impetuosity, shallowness or otherwise of a course or channel; of mountains, their shape, appearance &c.; of village sites, the stony, precipitous, meadow-like character, quality of soil, jungle-product, conspicuous tree &c.

Names of the country.—In naming the country, both the Lepchas and Bhotiyas characterized the most striking feature of the country, each from their own respective point of view. The Lepchas, a roving forest-people, even still living largely on jungle-products and sleeping under rocks for shelter, called this country Ne-layang or 'the country of caves,' while the Bhotiyas, a much more pastoral and agricultural race, who came from across the Himálayas, where rice is highly prized as food, but not there growable, called the country འབྲས་ལྗོངས་ *hbras-ljongs*, pronounced Dé-jong* or 'the rice-country,' as rice is abundantly cultivated in Sikhim. These Sikhim Bhotiyas in the course of the three or four centuries which have elapsed since migrating from Tibet, have acquired* a dialect which differs in many ways, but chiefly in pronunciation, from the polite speech now prevalent at Lhasa. One feature of this difference is the tendency, shared in common with the Tsang-pa Bhotiyas of Nepal, and already noticed, to insert a final *n* where such does not appear in Tibetan. The country has thus come vulgarly to be called Dén-jong, instead of Dé-jong, and the people generally call themselves Dén-jong-pa, *i. e.*, 'the people of Den-jong.' And the Lepchas in accepting the name imposed by their conquerors usually pronounce it Ren-jong—*r* being with them frequently interchangeable with the letter *d*.

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* As *de* is a form of *demo* བདེ་མོ་ = good, although the name of the country is not spelt in this way, it is occasionally called 'Demo-jong,' *i. e.*, 'the happy or good country.'

The etymology of the modern name of '*Sikhim*' is not at all so clear. It is generally alleged by the Lepchas and Bhotiyas to be a Parbatiyá name, applied to the country by the conquering Gorkhas. As the great majority of the Parbatiyá words are derived almost directly from the Sanskrit, I venture to suggest that the most probable derivation is from the Sanskrit शिखिन *Sikhin* = crested: this would characterize the leading feature of the approach from the Nepal side—a long high ridge, with Kanchinjunga 28,000 feet and Kabur 22,000 feet in its middle, separates this country from the Gorkha territory; and being shut off from Bhotan by another high ridge, the intervening narrow tract which constitutes Sikhim presents within itself an unusual number of ridges (crests) running more or less in N. to S. direction, transverse to the vista from Nepal.†

Many of the place-names merely denote halting places or stages presenting a rock-shelter or a clearing in the jungle with water-supply near, and occasionally pasture. These sites, being on lines of communication and always near a water-supply, occasionally develop into villages. These names were probably given by Tibetan merchants or other travellers such as priests or monks. The process of such name-giving might arise through a pioneer merchant or other traveller, narrating the stages of his journey into 'the rice country' (Dejong) and his successors adopting his stages and nomenclature. Such a traveller might be supposed as saying that, on crossing 'the level track pass'

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* In some instances the difference appears due to preservation of ancient forms of speech rather than a new development, or corrupt dialect.

† This name is not at all likely to be related to Skt. सेक, *sek*, to wet or moisten, for the climate of Sikhim does not appear to be more moist than that of the adjoining portion of Eastern Nepal. Nor does the conjecture seem tenable that it is a Parbatiyá translation of one of the vulgar forms of the Bhotiya name for the country, *viz.*, 'Demo-jong' or 'the happy country' from सुखी *sukhi*, happy; as the name is never spelt or pronounced with *u*, and the country was, and still is, a most inhospitable one.

(Je-lep-la), he passed the 'Saints' mount' (Kuphu) and 'the Guru's defile '[*] and reached 'the black meadow' (Na-thang) where he halted. Next day he proceeded down 'the steep descent' (Lung-thu), past 'the big clearing' (Phadom chhen), to the large Sedong tree' (Sedong chhen). Next day, continuing the descent, he crossed 'the water (chhu) at 'the Lepcha's house (Rong-li) and ascended to 'the big flat stone' (Dô-lep chhen) where he halted. The following day he crossed 'the black hill' (Ri-nak) and 'the mountain torrent' (Ri-ze chhu), and ascended to 'the Pö-tree halting place' (Pö-dang). Next day continuing his march, he lunched at 'the big spring' (Chhu-mik chhen), and crossing the ridge at the junction of 'the three hills' (Ri sum), reached 'the Kalön's stockade or 'pong' as the Lepchas call it (Kalön-pong), &c., &c.

The Pahàriyás and Bengalis are addicted to giving a personal name to their villages; this is perhaps inevitable where the area, as is usual in such cases, is thickly populated, and presents no striking natural features. The Pahàriyás share with Europeans the tendency to transplant to their adopted home, names taken from their old country, although these possess no local appropriateness in their new application.

On the date of the Bower Manuscript.—*By* A. F. Rudolf Hoernle.

The Bower manuscript was exhibited to the Society at the two meetings in November, 1890 and April, 1891. I call it the "Bower MS.," in order that Lieutenant Bower, to whose enterprise the learned world owes the preservation of the manuscript, may receive the honour due to him. Some account of the locality and circumstances of its finding will be found in the Society's *Proceedings* for November, 1890; and a preliminary account of the manuscript and its contents was published by me in the *Proceedings* for April, 1891. Since then I have spent a long summer vacation in carefully examining the whole manuscript, and, with the exception of a few leaves, I have read and transcribed the whole. I have every reason to hope that the Bengal Government, with its usual liberality in such matters, will enable me to publish a complete edition of the manuscript which I am now preparing.

This paper had been written (in Darjíling, in May), when I received (in July), through the kindness of Professor Bühler in Vienna, an advance copy of his notice[†] of the specimen pages of the Bower MS., which were published in the November *Proceedings*. It was particularly gratifying to me to find that, reading the manuscript, he in Vienna and I in Calcutta, at about the same point of time, we independently arrived at essentially the same conclusions, both with regard to the age and the contents of the manuscript. Such a coincidence most distinctly makes for the truth of our conclusions.

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[*] *Vide* detailed definitions at p. 60.

[†] To be published apparently in the *Vienna Oriental Journal*.

The substance of the paper which I now publish on the age of the Bower MS., and which I promised in the April *Proceedings*, was originally intended by me to form a part of the introduction to my edition of the manuscript. But seeing the interest which the manuscript has already excited in Europe, I publish it now in anticipation, and hope similarly to publish portions of the manuscript, with translations, from time to time.

I may state here briefly the result of my detailed examination of the manuscript. It consists of not less than five distinct portions.

The first portion consists of 31 leaves. It contains the medical work of which I have published the commencement in the April *Proceedings*, and two pages of which are figured in the upper parts of the two plates accompanying the November and April *Proceedings*. I shall designate it by the letter A.

The second portion, to be called B, which immediately follows the first portion, consists of five leaves, and forms a sort of collection of proverbial sayings. A specimen of it is figured in the lower part (No. II) of the plate in the April *Proceedings*.

The third portion, C, consisting of four leaves, contains the story of how a charm against snake-bite was given by Buddha to Ánanda while he was staying in Jetavana, the garden of Anáthapiṇḍa. A specimen of this portion is figured in the lower part of the plate in the November *Proceedings*.

The fourth portion, D, consists of six leaves. It is preserved in a rather unsatisfactory condition, and appears to contain a similar collection of proverbial sayings as the second portion, B.

The fifth portion, E, which also consists of five leaves, contains the commencement of another medical treatise. It appears to be—so far as I can judge at present—a fragment of a larger work.

Besides these five connected portions, there appear to be a few detached leaves, quite unconnected with one another and with those larger portions.

Of the fourth and fifth portions no specimens have been published, but the fifth is written in the same style as the first portion. The fourth portion is written in an exceedingly slovenly and hurried hand, much resembling that of the third portion, but written far more slovenly. It may possibly represent the handwriting of a fourth scribe; though, on the whole, I am disposed to believe that there are really only three distinct styles of writing represented in the entire manuscript. The first is that of the first and fifth portions (A and E); they are so nearly alike, that I believe them to be of the same scribe. The second is that of the second portion (B), which is a fine, ornamental writing. It must be ascribed to a distinct scribe. The third is that of the third and fourth portions (C and D), which seem to me to differ more in the manner than in the character of writing, and may not improbably be due to the same scribe, though a different person from the scribes of AE and B.

I come now to the question of the age of the MS. Here the first points to be settled are the locality and class to which the characters of the MS. belong. Mr. Fleet has clearly shown, in his Volume III of the *Corpus Inscriptionum Indicarum* on the Gupta Inscriptions,[*] that, irrespective of varieties, there existed, at the time of the Gupta period, two very distinct classes of the ancient Nágarí alphabet, the North Indian and the South Indian (see Fleet, pp. 3, 4). The test letter for these two great classes is the character for *m*, which in the Southern alphabets retains its old form 𑀫, resembling the figure 8, while in the Northern alphabets that old form has been displaced by a square cursive form म. Tried by this test, it is at once seen that the alphabet of our MS. belongs to the Northern class. Throughout the MS. the square form म is used exclusively. It is particularly distinct in the portions C and D; in ABE the left hand curved line in drawn rather more straight.

The Northern class of alphabets, however, is again divided into two great sections, which, though their areas overlap to a certain extent, may be broadly, and for practical purposes sufficiently, distinguished as the Western and Eastern sections. The test letter in this case is the cerebral sibilant *sha*. In the North-Eastern alphabet its form is ष, while in the North-Western alphabet its form is 𑀱.[†] Examples of the former alphabet we have on the Allahabad pillar inscription of Samudra Gupta, of about 400 A. D. (Fleet, pp. 1, 6), the Kuhaun pillar inscription of Skanda Gupta, of 460 A. D. (Fleet, p. 65), and others in Mr. Fleet's volume.[‡] The same alphabet is shown to perfection in the

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[*] All subsequent references to "Fleet" refer to this work.

[†] At the same time the Indian N. E. alphabet has the form स for the dental *sa*, the two forms of *sha* and *sa* being very little distinct from one another. The Indian N. W. alphabet has 𑀲 for *sa* which is also used by the Nepalese variety of the N. E. alphabet.

[‡] The following Nos. in Mr. Fleet's volame belong to this class: Nos. 1, 6, 7 8, 9, 11, 12, 13, 15, 64, 66, 68, 69; occasionally the Western form is used in conjuncts, such as *ksha*, *shṭa*.

Nepalese inscriptions, Nos. 1 to 10 and No. 12, published in the *Indian Antiquary*, vol. IX, p. 163; also in the Nepalese inscriptions Nos. 1 and 2, in Mr. Bendall's *Journey in Nepal*, pp. 72, 74. On the other hand, the other Nepalese inscriptions in vol. IX of the *Indian Antiquary*, Nos. 11, 13, 14, 15, and in Mr. Bendall's *Journey*, Nos. 3 to 6, exhibit the North-Western alphabet. The latter alphabet is also to be seen in all the Nepalese MSS., described in Mr. Bendall's *Catalogue of Buddhist Sanskrit MSS.*, including the two oldest, Nos. 1049 and 1702.

Examples of the North-Western alphabet in Mr. Fleet's volume are the Mathurá stone inscription of Chandra Gupta, of about 400 A. D., the Indor plate of Skanda Gupta, of 565 A. D., and others.* Also the Toramáṇa inscription in the *Epigraphia Indica*, Vol. I, p. 238, and the Nepalese inscriptions above mentioned.

In both the North-Eastern and North-Western sections there are divisions into varieties, some of which Mr. Fleet has noticed. However for my present purpose, there is no need to enter into any consideration of these. But the distinction of the two great sections is very marked, and can never be missed when once pointed out.

There is one point, worthy of notice, with regard to these two great Northern divisions. It is this, that in India proper the North-Eastern alphabet gradually came to be entirely displaced by the North-Western alphabet, in comparatively very early times. This displacement must have been in progress during the earlier part of the sixth century A. D., and must have been completed about 580 A. D. For in 588 A. D. we already find inscriptions in Bodhgayá (of Mahánáman, Fleet, p. 274) which show an exclusive North-Western character; and there is not a single inscription known (so far as I am aware) about and after 600 A. D. which shows the distinctive marks of the old North-Eastern alphabet. Outside of India proper, that is in Nepál, the North-Eastern alphabet maintained its ground for about three centuries longer; for the inscription, No. 4 in the *Indian Antiquary*, vol. IX, dated in 854 A. D., still shows the use of that alphabet. This survival is accounted for by the fact, that the North-Western alphabet made its way into Nepál, apparently, about a century later than into Eastern India proper. For the earliest known inscription, in that alphabet, is No. 11 in the *Indian Antiquary*, vol. IX, which is dated in 653 A. D. For the purpose of manuscript writing, as distinguished from documentary inscription, the North-Western alphabet probably made its way into Nepál very much earlier, as shown by Mr. Bendall's old MS. No. 1049, if (as I think it may well be) it is dated in 252 of the Gupta Era, that is, in 571 A. D.

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* The following Nos. belong to this class: Nos. 4, 10, 16, 19, 20, 22—37, 42, 43, 46—54, 58—61, 63, 65, 67, 70—72, 74, 76.

Now the Bower MS. is distinctly written throughout in the North-Western alphabet. This is an important point and must be kept in view throughout the following enquiry. The age of our MS. must be judged solely by the facts as disclosed by the circumstances of the North Western alphabet. No conclusion that can be drawn from circumstances connected with the South Indian or the North-Eastern alphabets may be applied to the determination of the age of our MS. For it stands to reason, that no scribe, who was habituated to write in the North Western alphabet, would in any writing of his habitually introduce any peculiarity of the South Indian or North Eastern alphabets, with which he was not familiar.

Having premised this much, I proceed to the consideration of the points that appear to me to afford the means of determining approximately the date of the Bower MS.

Among the existing varieties of the North-Western alphabet, there is one which has most nearly retained its ancient character. This is the so-called S'áradá alphabet, which is still current in Káshmír and the adjacent Sub-Himalayan provinces, such as the Chambá and Kángrá valleys. The most striking point of difference between the S'áradá alphabet and its more ancient parent, the original North-Western alphabet, is the sign for the letter *ya*. The S'áradá alphabet uses the modern cursive form 𑆪, while the original North-Western alphabet employed the more ancient tridental form 𑀬. This is the test letter by which any inscription or manuscript written in the S'áradá characters may be at once distinguished from any inscription or manuscript written in the more ancient North-Western alphabet. The latter I shall, for the sake of convenience, briefly distinguish as the Gupta alphabet. The oldest MS. in the S'áradá characters, of the existence of which we know, is the so-called Horiuzi MS., of which Professor Bühler has published an account and illustrative plates, in Volume I, Part III of the *Anecdota Oxoniensia.** According to him, "it is certain that this MS. cannot date later than the first half of the sixth century A. D." (*ibid.*, p. 64). It employs throughout the modern cursive form of *ya*. On the other hand, the Bower MS., though showing in the writing of parts A and E, in many respects, a very decided resemblance to the S'áradá characters, employs in the portions BCD exclusively, in AE almost exclusively, the older tridental form of the letter *ya*. It follows, therefore, that the *Bower MS. is not written in the S'áradá alphabet, but in the more ancient*

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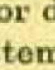
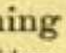
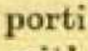
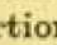
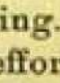
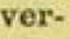
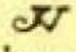
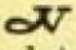
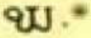
* "S'áradá" is the name of a small group of alphabets, the varieties of which differ a little according to locality (Káshmír, Chambá, etc.) or period or material of writing, etc.; but the essential unity of the group is well known, and it is usual to call it S'áradá.

Gupta alphabet. The general similarity of its letters to the S'áradá probably shows, that the locality of its writing was somewhere in the extreme North-West of India, but *its use of the ancient tridental form of YA shows that its date must be antecedent to the elaboration of the S'áradá form of the North-Western alphabet.* When this event took place, I shall now attempt to show.

The old form (though not quite the oldest which was ) of the letter *ya* was  or . It was made by two separate movements of the hand, one for drawing the left-hand perpendicular, the other for drawing the remaining portion of the letter. The next step was an attempt to draw the letter with one movement of the hand. This led to the contrivance of the form , by which the end of the left-hand crook or loop was brought forward to the point of junction of the perpendicular and horizontal portions of the letter. It was now possible to draw the letter with one stroke of the pen, beginning with the top of the left-hand perpendicular, downwards; then round the loop, from left to right, to the bottom of the perpendicular; than finishing with the right-hand crook or angle. This change was clearly due to the convenience of cursive writing. But the tendency of cursive writing to quickness and economy of effort very soon led to a further change, which produced the form , by severing the point of junction. This was the final form of the process; it is still essentially the modern cursive form. The intermediate form , as I shall presently show, only existed for a comparatively very short time, and is essentially a mere transitional form.

It is a well-accepted fact that cursive forms first make their appearance in manuscript writing, and may be, and generally are, in use in MS. writing some time before they are introduced in the inscribing of documents on stone, copper or other material. Such documents are of a conservative nature; they have a tendency to preserve old forms, after they have long disappeared from ordinary MS. writing. The common or exclusive use, in an ordinary MS., of a distinctly archaic form is, therefore, a safe means of determining its age.

The old form of the letter *ya* was once current in all the alphabets of India. In all of them it gradually became displaced by some cursive form. But this displacement did not take place in all of them at the same point of time. In the South Indian alphabet it survived, at least in inscriptions, down to the twelfth century A. D.* The North-Eastern alphabet, as I have already remarked, was, in India proper, as early as the middle of the sixth century, superseded by the North-Western alphabet; but in Nepál it survived about three centuries longer, and there, with it, the old form of *ya* survived, at least in inscriptions, down to the middle of the nineth century A. D. It should be noted, however, that the old form of *ya*, in the shape in which it survived in Nepál, is somewhat different from the old form in its original shape, as it was once current in the North Indian alphabets. Its original shape is that of a sort of trident, of which the left-hand prong makes a curve or even a loop, thus  or . In the Nepalese shape, the curve or loop, is replaced by a ringlet which is poised on the top of the left-hand prong, thus .* The difference is marked, and the two shapes can be very easily distinguished from each other.

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* In the old Kanarese, where it much resembles the later Nepalese form with the ringlet attached to the left prong (see p. 85). See, *e. g.*, the Eastern Chalukya inscription of 1134 A. D., in the *Ind. Ant.*, vol. XIV, p. 50, or the Kákatiya inscription of 1162 A. D., *ibid*, XI, p. 9. It has now passed into the various modern cursive forms of the South-Indian alphabets.

The North-Western alphabet is the first to discard the use of the old form of *ya*. From it, as I shall presently show, the old form disappeared, even in inscriptions, as early as the end of the sixth century A. D.; and from cursive writing in that alphabet, according to the well-known rule, above stated, it must have disappeared much earlier. There is an obvious conclusion, which is suggested by these facts; it is, that *the invention, so to speak, of the cursive form of YA took place in the North-West of India, somewhere within the area in which the North-Western alphabet was current.*

The first document from which the use of the old form has entirely disappeared is the long Bodhgayá inscription of Mahánáman of 588 A. D. (Fleet, p. 274). It uses exclusively the transitional form, with one or two exceptions in which the modern form itself is used.† In another short Bodhgayá inscription of Mahánáman, of about the same date (Fleet, p. 278), the modern form is used exclusively. *In fact, after 600 A. D., there is no inscription known, which shows any trace of the survival of the old form.* In all of them the cursive form of *ya* is fully established in exclusive use; thus in the Lakkha Mandal inscription of about 600 A. D. (*Epigr. Ind.*, vol. I, p. 10),‡ the Madhuban inscription of Harsha, of 631 A. D. (*ibid.*, p. 67), the Aphsaḍ and Sháhpur inscriptions of Adityasena, of about 672 A. D. (Fleet, pp. 200, 208), the Deo Baranark inscription of Jivita Gupta, of (about) 725 A. D. (Fleet, p. 213), the Sárnáth inscription of Prakaṭáditya of somewhere in the seventh century (Fleet, p. 284). To these may be added the evidence of those Nepalese inscriptions, which are not written in the North-Eastern or proper Nepalese alphabet, but in the North-Western characters; thus the Gaidhárá inscription of 688 A. D. (see Mr. Bendall's *Journey in Nepal*, p. 77), the Jaisí inscription of 751 A. D. (*ibid.*, p. 79), the inscription of S'iva Deva, of 748 A. D., another of 750 A. D., and the inscription of Jayadeva, of 758 A. D. (see *Indian Antiquary*, vol. IX, pp. 176-78). In all these inscriptions the modern cursive form is used exclusively.

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* See, *e. g.*, the inscription No. 8, in the *Ind. Ant.*, vol. IX, p. 171.

† The transitional form is here used with a somewhat modified and more ornate shape.

‡ The intermediate forms occurs twice in this inscription, in *yena*, ll. 6 and 11, curiously enough, with the vowel *e*, on which see page 89.

Another piece of evidence, in the same direction, is the Tibetan tradition respecting the introduction of the Northern Indian alphabet into Tibet (see *Journal, Asiatic Society of Bengal*, vol. LVII, pp. 41 ff.). It is said that these characters were introduced into Tibet by the sage Sambhoṭa, who brought them from Magadha, where he had resided from A. D. 630-650. These characters are known in Tibet as the "Wartu" characters of Magadha; their forms, as traditionally preserved in Tibet, may be seen in Plate I of the *Journal* (*ibidem*); and it will be seen that among these the letter *ya* has the cursive form. This shows that at the time of Sambhoṭa's visit to Magadha, in the second quarter of the seventh century A. D., the cursive from of *ya* was in current use in North India.*

I am not aware of the existence of a single dated inscription in North India, written in the North-Western alphabet, which indubitably proves any use, still less the exclusive or almost exclusive use of the old form of YA, after 600 *A. D.* It follows from this evidence that, since the old form of *ya* had entirely disappeared from inscriptions, from the end of the sixth century (say from about 580 A. D.), it must have disappeared from the cursive writing of ordinary manuscripts long before. Accordingly a manuscript, like the Bower MS., in which the old form is still used almost exclusively, must be placed long before the end of the sixth century, and much nearer the beginning of it.

This conclusion is fully supported by the evidence of all the ancient dated (or practically dated) MSS. that are, as yet, known to exist. The oldest is the Horiuzi MS. The date of its writing has been shown by Professor Bühler to be somewhere in the middle of the sixth century, that is, between 520 and 577 A. D. (see *Anec. Oxon.*, p. 63 ff.). It exhibits throughout the exclusive use of the cursive form of *ya*, *thus showing that this cursive form was fully established for MS. writing in the middle of the sixth century A. D.* The next oldest MSS. are two, described as Nos. 1049 and 1702 by Mr. Bendall in his *Catalogue of Buddhist MSS. in the Cambridge Library*, p. XXXIX. One of them is dated Saṃvat 252, which Mr. Bendall takes to be in terms of the Harsha era and to be equal to 857 A. D. For my part, I can see no valid objection, on palæographic grounds, to understanding the date in terms of the Gupta era, and as equal to 571 A. D. I do not notice any such material difference between the writing of the Horiuzi MS. and the two Cambridge MSS., as to account for a supposed interval of three centuries. Any how, both Cambridge MSS. exhibit the exclusive use of the cursive form of *ya*.

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* The "Wartu" characters exhibit in all test points the characteristics of the North-Western alphabet. This shows, what I have already observed (*supra*, p. 82), that the North-Eastern alphabet, which was once current in Magadha, was there in very early times displaced by the North-Western alphabet. It is said, however, that Sambhoṭa only "partly" adopted the "Wartu" characters for his Tibetan alphabet (*Journal*, *ibid.*, p. 41). This explains the fact that the "Wartu" or cursive form of *ya* does not appear in that alphabet. For the letter *ya* that sage appears to have drawn on the North-Eastern alphabet, which he must have known from Nepál, where (as I have shown) it maintained its ground from two to three centuries longer than in Magadha.

The conclusion appears to me inevitable, that *any MS. which shows, as the Bower MS. does, the exclusive use of the old form, or which shows an uniform absence of the use of the cursive form, cannot possibly be placed later than 550 A. D., and in all probability is very much older.* The only question is, whether there are any indications in the Bower MS. that render it possible to fix its date somewhat more definitely.

Here the following facts are to be observed. The first appearance of the modern cursive form of *ya* in any inscription is met with in the Bijagaḍh inscription of Vishṇu Vardhana, of 371 A. D. (Fleet, p. 252), in *śreyo*, line 4 (if the plate can be trusted); and it is to be noted that it is used in junction with the vowel *o*. The old form, however, is more usual, as in *námadheyena*, l. 3, and *abhivṛiddhaye*, l. 4, in both cases with the vowel *e*. The first appearance of the transitional cursive form is met with about a century later (see below), but there can be no doubt that, though in the existing inscriptions, the first appearance of the modern form happens to be earlier, that form, as compared with the transitional form of the letter, is of later development.* Probably there was no great interval between the development of the two forms. In any case, the invention (so to speak) of the transitional form and, with it, the first beginnings of the modern form of *ya*, may, thus far, be placed at about 350 A. D.

The actual first appearance of the transitional form occurs in the Indor copperplate inscription of Skanda Gupta, of 465 A. D. (Fleet, p. 68), in the words *abhivṛiddhaye*, l. 4, and *upayojyam*, l. 7, in both cases with the vowels *e* and *o*. Side by side, the old form occurs in *yogam*, l. 9, *yo* l. 11, *abhivṛiddhaye*, l. 8. Other instances occur in the Karitalai inscription of Jayanátha, of 493 A. D. (Fleet, p. 117), in

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* A similar case, with regard to the development of the letter *m*, is noted by Mr. Fleet in his volume on the Gupta inscriptions, p. 3, footnote.

abhivṛiddhaye, l. 7, and *chhreyo*, l. 15, here also with the vowels *e* and *o*; and side by side with the old form in *ye*, l. 10, *lopayet*, l. 12, *práyeṇa*, l. 16, *yo*, l. 20. Another instance occurs in the Khoh inscription of Jayanátha, of 496 A. D. (Fleet, p. 121), in the word *abhivṛiddhaye*, l. 8, again with the vowel *e*, and side by side with the older form in *pratyáyopanayaṃ*, l. 11, and *práyeṇa*, l. 17. A very clear instance is in the Tusam inscription, of about 500 A. D. (Fleet, p. 269), in *yogácháryya*, l. 3, again with the vowel *o*, and side by side with the old form in *upayojyam*, l. 6.* Another clear instance occurs in the Jaunpur inscription of I'śvaravarman, of about 520 A. D. (Fleet, p. 228), in *anvaváye*, l. 2, again with the vowel *e*. So again in the Mandasor inscription of Yaśodharman, of about 530 A. D. (Fleet, p. 149), in *yo*, l. 4, again with the vowel *o*, and side by side with the old form in *pádayor*, l. 5. Similarly in the Mandasor inscription of Yaśodharman as Vishṇuvardhana, of 533 A. D. (Fleet, p. 150), in *yena*, l. 8, again with the vowel *e*, and side by side with the old form in *bhúrayo*, l. 8,† *yena*, l. 8, 13, *yo*, l. 17, 18. Likewise in the Khoh inscription of S'arvanátha, of 533 A. D. (Fleet, p. 135), in *nyáyena*, l. 13, *ye*, l. 16, and *pratyáyotpannaka*, l. 9, again with the vowels *e* and *o*, and side by side with the old form in *lopayet*, l. 18, *grámayor*, l. 7, *yo*, l. 25, *ye*, l. 27, etc. These are all the instances of the occurrence of the transitional form that I have been able to discover among the 43 (Gupta) inscriptions in the North-Western alphabet, published by Mr. Fleet.

Contemporary with them are the following instances of the use of the modern cursive form. In the Maghgawan inscription of Hastin, of 510 A. D. (Fleet, p. 106), it occurs in the words *chhreyo*, l. 14, *yo*, l. 16, *paníyeshu*, l. 17, *ye*, l. 18, again with the vowels *e* and *o*, and side by side with the old form in the words *anvayopabhogyas*, l. 10, *yo*, l. 11, *ahayo*, l. 18.‡ The transitional form also occurs in the word *abhivṛiddhaye*, l. 7.

Now as to the conclusions that follow from the above statistics, note, in the first place, the extreme rarity of the transitional and full cursive forms, as well as the peculiar circumstances under which alone they occur. And here mark the following four points.

(1) *They occur only in a small proportion of inscriptions.* Of course, the only inscriptions with which we are here concerned are those that use more or less exclusively the old form. Those that already use

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* This instance was also noticed by Mr. Fleet (p. 270, footnote 4). It is the identical form that occurs in the Bower MS.

† This is a very good instance for comparison, because in *bhúrayo yena* the two forms stand in immediate juxtaposition.

‡ In these cases the peculiarity of the form is also noted by Mr. Fleet, p. 106.

the transitional or modern cursive forms exclusively are outside the question; so are, of course, all those that are not written in some variety or other of the North-Western alphabet. Now there are 34 inscriptions of the former description in Mr. Fleet's Volume III of the *Corpus Inscriptionum Indicarum.* To these may be added a few others, such as the Toramáṇa inscription in the *Epigraphia Indica,* vol. I, p. 238, and the Kumára Gupta seal in the *Journal, Asiatic Society of Bengal,* vol. LVIII, p. 88. Among these there are only ten inscriptions, a little more than *one-fourth,* that exhibit the occasional use of the transitional and modern cursive forms at all. The rest use exclusively the old form.

(2) *The transitional and full cursive forms occur, in that one-fourth of inscriptions, exclusively in connection with the vowels E or O.** With all other vowels, *i. e.,* in every other case, the old form is used.

(3) *Even in connection with the vowels E and O, the transitional and modern cursive forms are not obligatary, but optional.* In fact, even with those vowels, the old form is used more commonly than the transitional and modern cursive forms. On the whole the former is used twice as often as the latter.

(4) *Of the two cursive forms, the transitional and the modern, the former is used much more frequently than the latter* (*viz.,* transitional : modern = 13 : 4).

In the second place, note that the period during which the sporadic use of the transitional and modern cursive forms occurs, is a comparatively well defined and short one. Its termini, so far as the evidence of the available inscriptions goes, are from 371 A. D. to 533 A. D., or in round numbers from 370 to 540 A. D., *i. e.,* 170 years. Or, if we omit the very early case of the Bijagaḍh inscription, of 371 A. D., as perhaps of a suspicious character, because it stands by itself, separated by an interval of about 100 years from all others, *the transition period extends from about 470 to 540 A. D., that is, 70 years.* Antecedently to this period, we find the old form of *ya* in undisputed possession of the field, and subsequent to it, the cursive form of *ya* is in equally undisputed possession.

Now it appears to me, that from these facts there is but one conclusion, to which one is irresistibly driven. It is this, that there is here disclosed to us evidence of the actual point in time, when the invention, so to speak, of the cursive form of *ya* was made, or, to speak more precisely, the application of it to the non-conjunct *ya.* For to suit the case of the conjunct or under-written *ya,* the cursive form had been long before invented and exclusively employed. But to the non-conjunct *ya*, it only began to be applied about 470 A. D. At first it was only applied tentatively and hesitatingly in those cases in which the non-conjunct *ya* carried the vowels *e* or *o* (or *ai* or *au*). But the convenience of the cursive form soon carried everything before it, and displaced the old form entirely about 540 A. D. In all probably *this process commenced, in the case of manuscript writing, earlier than in that of documentary inscription, perhaps already about 400 A. D., and terminated proportionately earlier, perhaps about 500 A. D.* On the other hand, in documentary inscription the process began later and ended later. Here the use of the old form may have lingered on to about 600 A. D.; but from that date, as already shown from the evidence of existing dated inscriptions, the use of the cursive form of *ya* enjoyed an undisputed possession of the field.

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* Probably it would also be used with the vowels *ai* and *au*; though no instance happens to occur in the existing inscriptions.

Accordingly for practical purposes, the rule may be laid down, that *any inscription in the North-Western Indian alphabet which shows the more or less exclusive use of the old form of YA must date from before 600 A. D., while any inscription showing an exclusive use of the cursive form of YA must date from after 600 A. D.*

With regard to manuscripts the same rule must hold good, with this modification, that the termini must be put back by about 50 (or it may be 100) years; that is, *a MS. showing the exclusive use of the cursive form of YA must date from after 550 or perhaps 500 A. D., while a MS. showing the more or less exclusive use of the old form of YA must date from before 550 or 500 A. D., and a MS. showing the exclusive use of the old form of YA must date from before 450 A. D.*

That this rule, as deduced from the above collected facts, is correct is proved by the Horiuzi MS. This MS. uses the cursive form of *ya* exclusively, and, as shown by Professor Bühler, it certainly dates from some time between 520 and 577 A. D.

This rule further proves that the elaboration of the so-called S'áradá alphabet may be placed about 500 A. D. For it possesses the cursive form of *ya*. Hence it follows that *any manuscript and a fortiori any inscription, written in the S'áradá characters must certainly be later than 500 A. D.;* though as the S'áradá characters, with slight modifications, are used up to the present day in Káshmír and the adjacent regions, a mere consideration of the form of the cursive *ya* is insufficient to fix with any approximation the date of such a manuscript or inscription in any particular year after that epoch.

Now let us see the bearing of the results of the above enquiry on the question of the age of the Bower MS.

(1) It is to be noticed that *the old form of YA is used almost ex-*

clusively throughout the MS. Indeed, in the second, third and fourth portions it *is* used exclusively, and it is only in the first and fifth portions, that the transitional form occasionally occurs.

(2) *This transitional form is never used, except when carrying the vowels E or AI or O or AU.*

(3) *Even with those vowels, the use of the transitional form is optional;* though on the whole, it is more usual than that of the old form.

(4) *Of the two forms of the cursive YA, the transitional and the modern, the former is used almost exclusively;* the modern cursive form occurring only in a few isolated cases.

The following examples are all taken from the two published plates; and I have only to remark, that the pages, figured on the two plates, are very fair specimens of the whole manuscript.

The transitional cursive form is to be seen on Plate I, No. I,* in *yoga*, l. 1, *yoga*, l. 2 twice, *yogánáṃ*, l. 3, *trayodaśam*, l. 5, *kalpayet*, l. 9; again on Plate III, upper page, in *jívaníyo*, l. 2, *payo*, l. 4, *jívaníyaiścha*, l. 4, *lepayet*, l. 4, *vimiśrayet*, l. 6, *prayojayet*, l. 6, *avagáhayet*, l. 6, *yo...*, l. 6, *lehayet*, l. 8, *prayojayet*, l. 11. Note that it is always used with the vowels *e* or *ai* or *o*.

There is only one instance of the modern cursive form; it occurs in the akshara *yet* of *prayojayet* in Plate III, upper page, in line 11. Here we have the transitional and the modern cursive forms side by side in one word, the former form being used in the akshara *yo*, the latter in the akshara *yet*. A similar instructive example of the use, side by side, of the old and the transitional forms, we have *ibidem* in *prayojayet*, in line 6, where the old form is seen in the akshara *yet*, while the transitional form occurs in the akshara *yo*.

Of the old form there are the following instances. On Plate I, No. I, we have it in *chúrṇṇayet*, l. 10, and on Plate III, upper page, in *upakalpayet*, l. 2, * * *yet*, l. 3, *prayojayet*, l. 6, *lehayet*, l. 8, *páyayet*, l. 9. Note here again, that all these instances are with the vowel *e*. Of the old form with the vowel *o* there is no instance in the figured pages; but I have noticed a few cases in other parts of the manuscript. Of course, I exclude here, as being beside the precise point in question, all instances of the use of the old form in combination with any other vowel, only remarking, that it is used uniformly with all other vowels.

To sum up, the examination of the two specimen pages shows: *ad* Nos. 1 and 2, that the old form is used exclusively, except with the vowels *e*, *ai*, *o* and *au*†; *ad* No. 3, that out of 23 instances, in which the letter *y* is combined with the vowels *e* or *ai* or *o*, the cursive (transitional and modern) form is used in 17, while the old form is used in 6; that is, the former is used about three times as often as the latter; *ad* No. 4, that out of 17 instances of the use of the transitional and modern cursive forms, the former is used 16 times, while the latter occurs only once; *i. e.*, that the transitional form is used almost exclusively.

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* Plate I is in the April *Proceedings* 1891, and Plate III in the November *Proceedings*, 1890.

† Of *au* there is no instance in the figured pages, but I have met with a few in other pages of the manuscript.

Now comparing the case of the Bower MS. with that of the Gupta inscriptions, the result is this, that the two cases, while fully agreeing in the main points, differ only in one particular, namely, that the cursive (transitional or modern) form is used in the manuscript rather more frequently than the old form (*viz.*, cursive: old = 3 : 1), while in the inscriptions the old form is used rather more frequently than the cursive form (*viz.*, cursive: old = 1 : 2). This, however, is nothing more than may be expected, if we consider that on the one side we have a case of ordinary manuscript writing, on the other one of documentary inscription, and remember that (as Professor Bühler says, in *Epigraphia Indica,* p. 68) "everywhere in India the epigraphic alphabets are in many details retrograde and lag behind the literary ones."

One thing, however, is clearly brought out by the evidence above set out, that the writing of the Bower MS. must be placed within that period, which, as we have seen, is marked out by that evidence as the period of transition from the use of the old rigid form of *ya* to the use of the (still existing) cursive form; that is, for manuscript writing, *within the period from about 400 to 500 A. D., or the fifth century.*

It is true that in the second, third and fourth portions of the Bower MS., the old form is used exclusively. There is no trace whatsoever of either the transitional or the modern cursive forms. Judging by this circumstance only, we should have to place the MS. still earlier, somewhere before the fifth century A. D. But this would certainly seem to be wrong with regard to the second portion. For the fact, that this portion was written after the first, seems to be clearly proved by the circumstance that it commences on the reverse of a leaf, on the obverse of which we have the ending of the first portion. Properly considered, however, that circumstance only tends to confirm the conclusion that the main portion (ABE) of the Bower MS. was written during the transitional period. For it is only natural to suppose that during that period, some scribes had already more or less adopted the new fashion of cursive writing, while others, more conservative, adhered to the older fashion. On the whole, therefore, considering that the portions A and E of the MS. appear to manifest a decided tendency to a free use of the transitional form, it will probably be safer *to place the date of the main portion of the MS. nearer to the end than the beginning of the transi-*

tion period, that is to say, in the second half of the fifth century (say, about 475 A. D.). *The portions C and D, however, may be referred to the commencement of that period* (say 425 A. D. or even earlier).

This result will probably be startling to most of my readers. There exists,—and I admit, hitherto not without reason—a pretty general tendency to discredit any claim to great age on the part of any Indian manuscript. I used to incline to the same opinion, and the present result was an unexpected one to myself. But I do not see, how the force of the evidence can be gainsaid.

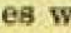
Let us see what the objections are. In the first place it is said, that the material of the MS.—birch bark—is of a nature too weak and flimsy, to permit us to believe that it could endure for such a length of time. This argument has been already well answered by Mr. Bendall in his *Catalogue of Buddhist Sanskrit MSS.*, p. XVII ff., and by Professor Bühler in the *Anecdota Oxoniensia*, vol. I, part III, p. 63 ff. No *a-priori* rule will apply; all depends on the circumstances under which a MS. may have been preserved; and the argument, from the nature of the material, will not stand for one moment against positive arguments from epigraphic history. According to Lieut. Bower's account, the MS. "had been dug out of the foot of one of the curious old erections just outside a subterranean city near Kuchar." These erections are described as being generally about 50 or 60 feet high, in shape like a huge cottage loaf; built solid of sun-dried bricks with layers of beams now crumbling away." I suppose it cannot be doubted that these erections are Buddhist stúpas. Such stúpas often contain a chamber enclosing relics and other objects; these chambers are generally near the level of the ground or "at the foot" (as it is said) of the erection, and they are often dug into by persons who search for hidden treasures. In this way the MS. was probably dug out, perhaps not long before it was made over to Lieut. Bower. In such a, practically air-tight, chamber there is no reason why a birch bark MS. should not endure for any length of time.

Another objection is that the characters used in a MS. are no guide to its age. It is said that "characters of the Gupta type have been used in very late times, and indeed are in use to the present day all along the region from which the Bower MS. comes." The characters which are here meant, are those used in the Káshmír, Chambá and Kángrá valleys. They are those which are commonly known by the name "S'áradá characters. These, as already remarked, are a variety of the North-Western alphabet, and are that variety which has, more than any other, preserved the shapes of its ancient parent, the North-Western Gupta alphabet. Now it is not quite correct to say, that the S'áradá alphabet has not changed; it is quite possible to distinguish the modern form of the S'áradá from its more ancient form. But what is really important is this, that *the S'áradá alphabet, so far as we have any dated evidence, never possessed, at any period of its existence, the old (Gupta) form of the consonant YA. It always possessed exclusively the modern cursive form of that letter.* I maintain, that there exists not a single *dated* MS. or inscription, written in any variety of the S'áradá alphabet, which does not show the exclusive use of the cursive form. This being so, it follows that any conclusions, drawn from facts connected with the S'áradá alphabet, have no application to a MS., which shows the almost exclusive use of the old (Gupta) form of *ya*, and which, therefore, is *not written* in the S'áradá characters. Now, what conclusions can be drawn from the facts connected with the S'áradá alphabet? Its exclusive use of the cursive *ya* shows that its elaboration is to be dated on this side of 500 A. D. But as it has but little changed the shape of its letters since the date of its inception, it follows, that any undated MS. or inscription written in the S'áradá alphabet *must* be placed after 500 A. D., but *may* be placed almost at any time *after that epoch*. That is really all that can be intended by the principle that the S'áradá characters are no guide as to age. More the principle will not bear, and it clearly is not applicable to a MS. which is not written in the S'áradá characters, but in a form of alphabet more archaic and very possibly the parent of the S'áradá. With the proviso, now explained, I fully agree with Professor Kielhorn's remark, made with reference to a Chambá Grant (in the *Indian Antiquary*, vol. XVII, p. 7) that "it would be impossible to determine the age, even approximately, from its characters," these characters being, as Professor Kielhorn explains, the well-known S'áradá. Judging from these characters, all that one could say would be that the grant may date from any time after 500 A. D., which, of course, would be a futile proposition.

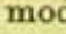
The main argument for the age of the Bower MS. is the preservation in it of the old form of *ya*. No objection can be raised on the ground that the old form was preserved much longer in the South-Indian and the North-Eastern Indian (Nepalese) alphabets. As these alphabets differ from the North-Western Indian, which is used in our MS., any conclusions, drawn from the circumstances of those alphabets, have no applicability to our MS. It stands to reason that no scribe, used to his own North-Western Indian alphabet, would, in writing a MS., think of introducing the old form of a letter, which did not exist any more in his own alphabet, from another alphabet, unfamiliar to him, in which it did still exist.

P. S.—Since writing most of the above remarks I have, as already stated, read and transcribed nearly the whole of the manuscript. I have carefully noted every occurrence of the aksharas *ye*, *yo*, *yai*, and *yau*.

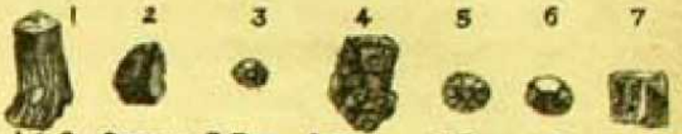
In the portions BCD I have found the cursive form (either transitional or modern) used *not once*. The aksharas *yai* and *yau* never occur; the akshara *ye* occurs 19 times (B 4, C 13, D 2), always with the old form of *ya*. The akshara *yo* occurs 9 times (B 7, D 2), again always with the old form.

In the portions A and E, the case stands thus: there are altogether 333 cases of the occurrence of those aksharas, *viz.*, 202 of *ye*, 125 of *yo*, 4 of *yai* and 2 of *yau*. In every case of *yai* and *yau* the transitional form  is used. With *ye* and *yo* the transitional form is used 227 times, and the modern form , 16 times. The transitional form occurs 117 times with *ye*, 110 times with *yo*, 4 times with *yai*, and twice with *yau*. The modern form occurs 12 times with *ye*, and 4 times with *yo*. Altogether the cursive form occurs 249 times. The old form occurs 73 times with *ye* and 11 times with *yo*. The following table exhibits this:

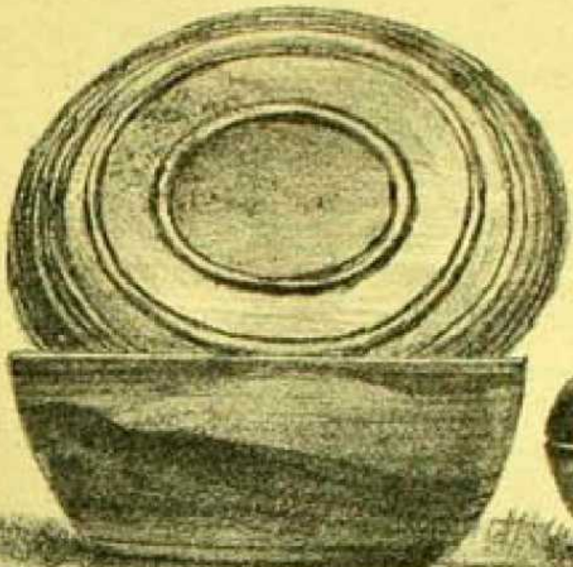
Aksharas:					Totals.
Old	*ye* 73	*yo* 11	*yai* 0	*yau* 0	84
Transitional ...	„ 117	„ 10	„ 4	„ 2	233 } 249
Modern ...	„ 12	„ 4	„ 0	„ 0	16 }
Totals ...	*ye* 202	*yo* 125	*yai* 4	*yau* 2	333

Now with regard to point No. 3 (see p. 89), there being 233 cursive forms to 84 old ones among a total of 333 cases, the proportion of cursive to old forms is as 3 to 1. With regard to the point No. 4, there being 233 transitional to 16 modern forms among a total of 249 cases, the proportion of transitional to modern forms is as (about) 15 to 1. In both cases, it will be seen, the evidence of the entire manuscript most accurately bears out the evidence of the specimen pages (see p. 91) and thus confirms my conclusions based on the latter. I may add with regard to the points Nos. 1 and 2, that in the portions A and E, the cursive (transitional or modern) form never occurs in any other akshara but those four: *ye, yo, yai, yau*. With the aksharas *ya, yá, yi, yí, yu, yú*, in every case, without any exception, the old form  is used. The occurrence of these six aksharas, especially of *ya* and *yá* is very frequent, and this fact all the more accentuates the striking circumstance that the cursive form is only employed with the vowels *e*, *o*, *ai*, and *au*. There must have been some reason for this peculiarity,—perhaps one of mere convenience of writing, though I cannot suggest any satisfactory one. I should note, that the vowels *e*, *o*, *ai*, and *au* are drawn, both with the old and the cursive forms, in every possible variety: entirely side-marked, half side and half top-marked, and entirely top-marked. The cause of the peculiarity, therefore, cannot well have had any connection with the form of the vowels.

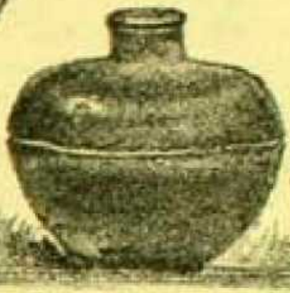
I would suggest that similar statistical enquiries should be made with reference to some other leading letters; e. g., *m*, *sh*, the sub-scribed *y*, the super-scribed *r;* also with regard to the numeral symbols. I have little doubt but that from such statistics may result some further useful land-marks for the determination of dates of writing. I hope to pursue the enquiry myself, so far as leisure from official duties will permit me.



1 & 2, CORAL: 3, EMERALD: 4, RELIC: 5, SAPPHIRE: 6, RUBY: 7, AQUAMARINE BEAD:
(All Full Size)



CLAYSTONE POT.
(1/2 Size.)



COPPER POT.
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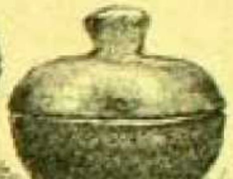
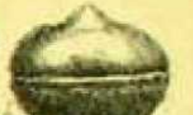
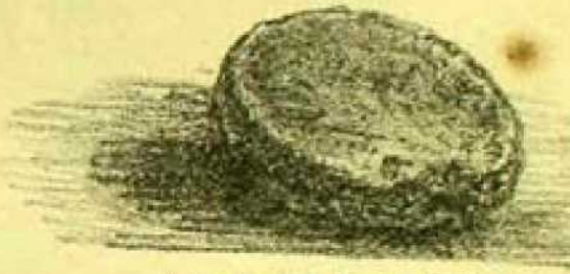


SILVER POT.
(1/2 Size)

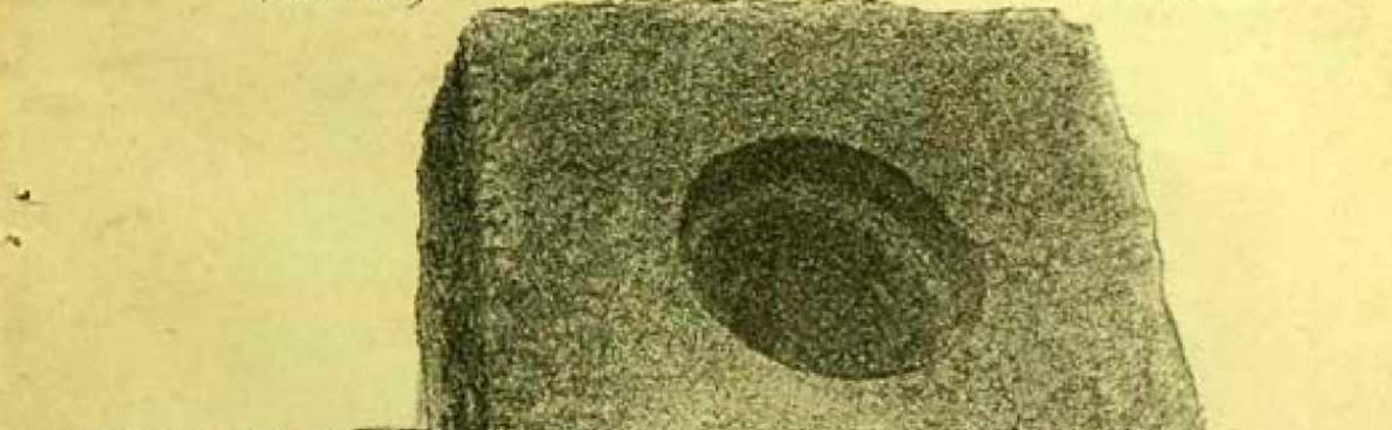


GOLD POT.
(1/2 Size)

CHIPS OF BROKEN POT.
(1/2 Size.)



LID OF THE STONE COFFER.
(1/2 Size)



STONE COFFER & UPPER BLOCK SEEN BEHIND. (1/4 Size.)

RELICS FROM THE BORIA OR LAKHA MEDI STÚPA NEAR JUNAGADH.

LITHOGRAPHED BY A. L. PAIN, 3, ARFULI LANE, CALCUTTA, 1891.

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Part II.—NATURAL SCIENCE.

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XII.—*Natural History Notes from H. M.'s I. M. Survey Steamer* "Investigator," *Commander* R. F. Hoskyn, R. N., *Commanding—No. 25. The Vegetation of the Coco Group.—By* D. Prain.

[Received—Oct 23rd; read—4th Nov. 1891.]

§ Introductory.

The Cocos are a small group of three islands, Table Island, Great Coco, and Little Coco, lying about 30—45 miles north of Landfall Island, the most northerly of the Andaman group proper, in Lon. 93° 21′ E., Lat. 13° 56′ to 14° 10′ N., and form one of the links in the island-chain that stretches southwards from Cape Negrais in Arracan to the Nias Islands off the western coast of Sumatra.

The first link in this chain is Diamond Island, Lon. 94° 18′ E., Lat. 15° 51′ N., 8 miles south of Cape Negrais and 130 miles north-north-east of the Cocos; the next is the island of Preparis, (not yet botanically investigated), larger than Diamond Island but smaller than the Great Coco, 80 miles south-south-west from Diamond Island and 50 miles to the north of the Cocos. The strait between Diamond island and Preparis is somewhat under 100 fathoms, that between Preparis and the Cocos somewhat over that depth. The channel between the Great and the Little Coco is under 50 fathoms, a depth not greatly if at all exceeded in the passage between the Cocos and Landfall. The next link in the chain is the Andaman Group proper, extending from about Lat. 10° 40′ to

13° 45′ N., consisting of several large islands that are separated by straits and channels which, with the exception of a passage 30 miles wide and about 100 fathoms deep between Rutland Island and Little Andaman, are all very narrow and usually quite shallow. Further south we find in the same chain the Nicobar Islands; these, separated by wider intervals than the members of the Andaman Group are, extend from 6° 45′ to 7° 15′ N. Besides being wider, the passages between the individual islands here are much deeper and the main channels between the Andamans and Nicobars on the one hand, and between the Nicobars and Sumatra or the Nias Islands on the other, in place of being under 150 fathoms deep, give soundings of 500, 750, and even 900 fathoms. There is, however, along the line from Little Andaman to the island of Simalu or to Acheen Head an undoubted ridge, for the floor of the Sea of Bengal to the westward is 2,000 fathoms deep, and that of the Andaman Sea to the eastward is in some places at as great a depth. Whether any portion of the now submarine sections of the southern, or Nicobars half of this ridge has ever been subaërial it is difficult to say but it seems likely from its present physiographical configuration that the most recent land connection must have been between the northern or Andaman half of the ridge and the adjacent Indo-Chinese district of Arracan.

Table Island, the most northerly member of the Coco group, and lying 45 miles north of Landfall, is about a mile across and is rather longer than broad, with a considerable outlying islet, Slipper Island, at its north-west corner; southward, across a strait about two miles wide, lies the Great Coco some 9 miles long from north to south and about 2½ across at the widest part with several small islets off both its east and west coasts and with a very considerable outlying islet, Jerry Island, at its southern extremity; finally, some 6 miles south-west of Great Coco, and 30 miles north of Landfall, is the Little Coco about 2¼ miles long from north to south and ¼ to ½ a mile wide.

Through the kindness of Capt. Hoskyn, R.N., the writer, in company with Dr. Alcock of H. M. I. M. "Investigator," has been able to visit the group on two occasions. On Nov. 30th and Dec. 1st, 1889, Table Island was examined. On Dec. 2nd, 1889, a naturalist's party, which the writer was privileged to join, landed on Great Coco and remained encamped on a small cleared hill in its north-eastern peninsula until Dec. 8th. From Nov. 14th till Nov. 23rd, 1890, a similar party, of which the writer again was a member, was encamped on a sandy spit covered with coco-nut trees at the south end of the island; while between Nov. 25th and Nov. 30th, 1890, the Little Coco was examined.

On Table Island is situated the well known lighthouse of this name and the western slopes of the main island as well as most of Slipper Island, which at low-tide is not separated from the main island, are cleared on account of some cattle of which the lighthouse-keeper has charge. Throughout the rest of the island, however, except for a few pathways that have been cut on account of the cattle, the jungle is very dense and uniform. Around a bay at the south side of this island as well as on the north coast is a fringe of coco-nut trees. The height of Slipper Island is 110 feet; the highest point of Table Island proper is 150 feet. On the occasion of the visit referred to, the eastern half of the island, where the jungle is as yet intact, was traversed from south to north; the northern and western coasts were examined; the island was traversed from west to east along one of the cattle paths; the clearing was also examined for introduced weeds and escapes from cultivation.

On Great Coco Island there is a small clearing on a peninsula that forms the north-eastern extremity of the island, the site of an abandoned settlement which, some years ago, it was attempted to effect and where the writer was encamped during his first visit. Except at this point and on two or three of the more exposed cliffs and slopes on the western sea-face of the island, which are only grass-clad, there is a uniform jungle from end to end of the island and from base to summit of the numerous more or less parallel steep ridges that compose it. The shore is fringed with coco-nut trees in quite a thin belt where the ridges that compose the island come close to the shore, and this fringe is broken here and there where these ridges end in abrupt headlands; the belt widens however at the heads of the various bays and in two places in particular,—on the eastern side of the island along the bay that extends southward from the north-eastern peninsula already mentioned, as well as across the isthmus joining this peninsula to the main island and thence along the northern end of the island to the mouth of the principal creek—again, on the western side of the island for half a mile or more northwards from the southern end—this belt of coco-nut trees is 100 yards or more in width. Where the beach meets the coco-nut belt there is an invariable sea-fence of *Pandanus* with other ordinary Indian Ocean littoral plants; this fence is generally less dense where the beach is composed of sand than when it consists of coral shingle. Except on the very crests of the ridges, and sometimes even there, and on the more exposed western headlands, the forest is composed of very tall trees with below these a dense undergrowth; this undergrowth is particularly dense, owing to the number of creepers, on the crest of ridges destitute of tall trees, and on the slopes of the western sea-face that are not grassy. It is also very dense immediately behind the coco-nut belt especially if, as frequently happens, this belt passes insensibly into the mudflats that characterise the outskirts of a mangrove swamp. On the sides of ridges however, as opposed to their crests, the under-jungle is not so dense, largely owing to the mass of creepers being carried up to the tall trees above, while on the neck of land that connects the main island with the peninsula at the north-east corner, and on the narrow, more level tongue that forms the south end of the main island and stretches towards Jerry Island, the jungle is rather opener and more penetrable than elsewhere. The height of the outlying north-eastern peninsula which probably at one time has been a separate islet, at least at high-tide, is 80 feet; the highest ridge of the main island has an elevation of 300 feet; the other ridges mostly reach from 150—200 feet. Jerry Island, the chief outlying islet off Great Coco, consists at the southern end of a low ridge 60 feet high with a vegetation quite like that of the ridges on the main island; the northern half, however, consists of a level spit stretching towards the main island; this spit is composed of coral-shingle, and though covered with coco-nut and other trees there is only a sparse undergrowth within its *Pandanus* belt. Between Jerry and the main island extend wide sandstone reefs on which the waves and currents have thrown up a small eyot of sand, coral-shingle, dead shells, and drift timber on which stranded fruits and seeds are germinating. The other outlying islets call for no remark; all of them look like detached continuations of particular ridges and most of them have the vegetation characteristic of these. During the first visit daily excursions were made into the island towards the northern and eastern parts; the jungle was found to be so dense on the ridges and the level ground so difficult owing to the ramifications of a considerable creek, which, with its concomitant mangrove swamps, finds an outlet into the northern bay, that it was only on one occasion that the western coast was reached. It was impossible to do anything like justice to the interior; still, the northern and north-eastern peninsulas, the northern half of the east coast, the north coast and about two miles of the west coast at the north end were fairly thoroughly examined. During the second visit, profiting by the experience of the former season, fewer attempts were made to force a passage in a straight line through all obstacles and the edges of ridges—*juga ipsissima*—were in particular carefully avoided. The compass was discarded, no particular objective in the shape of a hill visible from the sea-shore was permitted to occupy the attention exclusively; the easiest rather than the shortest road was chosen as the route to be followed. In this way the island was crossed in four or five different places, all, however, towards the southern end; the west coast was explored for about four miles and the east coast examined northwards as far as the point reached when working in the opposite direction in the previous year. The outlying islet, Jerry, was also examined fairly thoroughly and its coasts skirted.

Little Coco consists of several ridges the highest having an elevation of 200 feet. The ridge jungle is much as in the other islands, but the level land is more largely composed of a basis of coral-shingle than is the case in the other two islands and the undergrowth is not quite so dense as in the level land on Great Coco. The coco-nut fringe is quite as uniform as in the Great Coco, but there is only one point,—at the head of a shallow bay in the middle of the west coast,—where the belt is as much as thirty yards wide. During his visit to this island the writer was able to cut his way from west to east across the highest ridge; to cross in another part along more level and frequently swampy ground; to work through a lagoon that occupies the south-western part of the island, and to skirt the whole coast on two different occasions.

The islands have all the physical features of the Andaman islands of the main chain as opposed to those of the Archipelago lying to the north-east of Port Blair; the rocks indeed recall at once those of Ross Island and of the shores of Port Blair in South Andaman. They are also equally like those forming Diamond Island, off the Arracan coast at the mouth of the Bassein river and, as in these localities, are best seen at points where the inland ridges end in abrupt headlands or are continued as long reefs exposed wholly, or in part, at low-tide.* Such reefs not infrequently rise into outlying islets. These islets are some distance from the main island, and are bare and rocky, or jungle-clad, according to size and exposure, those off the west coast being all very bare. The bays between the headlands are mostly wide and shallow, and are filled up, except opposite the mouths of creeks, with an accumulation of coral debris that becomes at times banked up, causeway-like, between the shore and an outlying island; these causeways are in some instances becoming stocked with the mangrove-vegetation of the neighbouring creeks.

The floor of these shallow bays is remarkably flat and uniform and is, at the sea-edge of the bay where the reef ends, generally rather shallower than it is within, so that at low-tide each bay consists of a long shallow pool, one to two feet deep, separated from the sea itself by a long low bank of exposed coral. The bottom of such a pool is usually covered by a close meadow of *Cymodocea ciliata*, but though this species is so common there seems to be no other marine phanerogam present. *Algæ*, too, are remarkably inconspicuous, being of small size and very scarce; the only exceptions are *Turbinaria ornata*, which is fairly frequent both on the coral reefs and on the sandstone ledges; *Padina pavonia*, more common on the exposed sandstone reefs but less frequent on the coral than *Turbinaria;* and *Sargassum ilicifolium*, which is the only really common seaweed and which occurs in great meadows at the outer margins of the fringing reefs and sandstone ledges that are exposed at low-tide, as well as in the deeper water beyond.

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* For further notices of the physiography of the islands the reader is referred to *Alcock; Nat. Hist. Reports* in *Hoskyn, Administration Reports of the Marine Survey of India* 1889-90, pp. 14, 15; 1890-91, pp. 11, 12; where also notices of the fauna, particularly marine, will be found. In *Hume; The Islands of the Bay of Bengal* in *Stray Feathers*, vol. ii, pp. 111—119, an account of these islands will also be found; there the ornithology of the group is exhaustively discussed.

Reefs such as those described are extremely common in all the islands of the Andaman and Nicobars groups that the writer has visited, and the marine vegetation is remarkably uniform in appearance as well as in specific constituents. On Car Nicobar, for example, as well as on Rutland Island, at the extreme south end of the Andaman main group, localities which the writer has visited on different occasions, it is hardly possible to detect a species not represented on the reefs of the Cocos. On similar reefs in South Andaman, however, a second species of *Cymodocea*, quite as profuse where it exists, but more local in its occurrence, has been gathered, and on a similar reef in Little Andaman large meadows of *Halophila ovalis* were found associated with those of *Cymodocea*. The beach between such a reef and the *Pandanus* sea-fence consists, so far as the writer's observations extend, almost exclusively of coral sand mixed with small shells or fine fragments of large shells. The heavy surf in such a bay as this breaks at the outer margin of the reef, and even at high-tide in rough weather the swell is so weakened there that the waves which break on the beach are not so heavy as to have any great erosive power. Indeed their effect appears to be on the whole accretive, for the sand that accumulates at the head of the bay becomes bound by *Ipomœa biloba, Sesuvium, Euphorbia Atoto*, etc., the *Pandanus* fence encroaches on the beds of *Ipomœa;* the coco-nut zone widens seawards, and behind it the first line of beach-forest, containing *Terminalia, Hernandia, Erythrina, Pongamia, Stephegyne, Thespesia*, and the second line of the same forest, characterised by *Mimusops, Gyrocarpus, Pisonia, Ardisia, Cycas* assert themselves in an area previously covered by the tides. In certain situations, too, the true mangroves stalk forward into the tolerably quiet waters of these bays, while in a different but equally effective manner, by sending up suckers from among its curious pith-like roots, *Avicennia* establishes itself upon the reef. The guyed and stilted habit of the former makes their position very secure; the latter, from the enormous area covered by its roots, must also be difficult to overthrow. The process of land-making behind a fringing reef, either as a sandy flat covered with coco-nut trees, or as a mangrove swamp spreading seawards, is well exemplified in the two bays lying respectively to the south and to the north of the position of the first season's camp; the effects are so like what must result if land were slowly rising that it is only after careful examination of all the conditions that one's mind becomes disabused of this specious impression. There is no direct evidence that the land is rising and, as will be evident on considering what has been said above, there is no necessity for supposing that it is. But though this is a very common type of bay, it is not the only type. On Great Coco, in some cases, and on Little Coco very generally a different stage may be observed. The shallow pools described as existing between the surf-built embankment at the margin of the fringing-reef and the beach, have in them many living corals that raise great rings which rise to almost the surface of the water in the pool at low-tide and, like huge lichens, grow peripherally till they meet and coalesce. The surf, too, breaks off pieces of greater or smaller size which are lodged in the pool behind, and by-and-bye become more or less cemented together. In this way the whole of a pool becomes in time completely filled up with growing coral and cemented blocks, and there are many reefs, especially on Little Coco, that are completely uncovered at low-tide, while small patches of similar reef are here and there seen that ordinarily the high-tides do not cover. The uniformity that the surfaces of some of these exposed reefs display is very striking. They are almost as even as a paved floor and are as bare and destitute of marine vegetation as they are of living coral. The edge of such a reef, in place of being a fairly continuous embankment higher than the floor of the bay behind, is now broken into hundreds of jagged gulleys through which the wave-wash from the almost level platform tears its way back to the deep water beyond the fringing-reef. The main interest of this stage of the reef is less, however, from the present point of view, its actual physical condition than its effect on the vegetation of the shore.

Behind a coral bay like one of those first described, and which characterises a less advanced stage of the history of the fringing-reef, has gone on a long and steady growth of land, with some shingle in it doubtless, especially as one approaches the nearest ridge, but chiefly composed of coral sand with a thin coating of humus derived from the vegetation it has supported. The main force of the surf has for long been spent on the outer embankment, and the force of the waves that at high-water passed over its top has been so much diminished ere these reached the beach that there they did not act destructively. Now all this is altered. At low-tide the force of the surf is still all expended on the edge of the reef, but as soon as the water has risen so high that the edge of the reef is covered, this force instead of being dissipated in the deeper water of a pool is accentuated as the breakers roll landward across a reef on which the water shallows slightly as the shore is approached; by the time the surf ceases to break on the edge of the reef practically its whole force rolls in over this even and slightly shallowing reef till it falls on the shore in huge erosive breakers that eat away the soil, so that *Pandanus* fence, coco-nut zone, and beach-forest all in turn disappear, and the waves at high tide grind on the prostrate stems of huge *Mimusops*, *Ficus Rumphii*, and *Dipterocarpus* trees, and undermine the roots of their old companions that are still standing but that the next storm will lay beside those on the beach. But this active denudation no more indicates a sinking of the land than do the heightened reefs that cause the action indicate that the land has risen, and as direct indications either of rising or of sinking are altogether absent we must conclude that the islands are at present practically stationary. But it is interesting to find, as one does here, in adjacent bays, such diverse indications of the same condition.

There are bays of a third type in the group, few in number, however, and of small size, in which the water is deep quite up to the beach; the sweep of the waves in these is extremely large, even when the sea outside is quiet, owing to the strong currents that prevail round the islands. They have all, as might be expected, rocky sides; the beaches on which the waves break are of sand, not shingle, and owing apparently to this excessive sweep of the waves the *Pandanus* fence and coco-nut zone at the head of such a bay is a good number of yards away from the beach, a considerable sand-bank covered with *Ipomœa biloba*, *Vigna lutea* and other sand-binding species, intervening between the limits of ordinary tides and the woody vegetation.

The nature of the beaches behind the numerous long, comparatively flat sandstone ledges, exposed at low-water and therefore not coral-covered, has yet to be noted. Such beaches are always of coral-shingle mixed with large shells, the pieces of coral being rounded or oblong and sometimes of considerable size. The most remarkable example of such a beach in this group is that at the south end and south-east corner of Little Coco where the sandstone reef is particularly extensive and where the south-west monsoon must break with singular force. This beach consists of an abrupt shingle wall, in many places 6 or 7 feet high, and yet not much wider at the base than twice its own height. Though very steep towards the sea-face it slopes more gradually at the back; behind it at this point there stretches a low flat tract of muddy land not much higher than the reef itself, covered by a dense jungle of *Hibiscus tiliaceus*, *Vitex Negundo*, *Leea*, and similar shrubs, but with few trees, the whole loaded with tangled masses of *Cassytha*. The *Pandanus* fence is here particularly dense, and along with it are coco-nut trees growing on the shingle; from the appearance and size of these it seems clear that, slight as the defence seems, this shingle beach completely prevents erosion though at the same time accretion is probably very slow. In the case of the highest and most advanced coral reefs usually the same shingle beach occurs; from which fact we might conclude that as the initial stage of any fringing-reef must have been that of a simple submerged sandstone ledge of greater or less extent, we see here the original shingle beach, thrown up where this ledge originally became subaërial, to which the waves have eaten back over the present raised reef until all the sandy soil formed during the earlier "embankment and pool" stage has, with the vegetation it supported, been swept into the sea. This shingle having been reached the erosive action has been checked, and the surer, if slower process of shingle accumulation has been initiated or, at all events, renewed. From this account of these bays it will be seen that the fringing-reef exhibits in some parts a phase more advanced than it exhibits in others. But it does not therefore follow that these more advanced "platform" portions are older than the earlier "embankment and pool" portions. They cannot, in one sense, be so old, for we must suppose that all these reefs commenced contemporaneously, and the "embankment and pool" reefs are still growing, whereas the "platform" reefs have now no living coral. The different stages therefore merely indicate that the sandstone reefs running out from the headlands in which the various ridges end are in different parts of the islands situated at different depths, and the condition of the reefs indicates that the sandstone ledges are shallower, and that deep water is further from the shore towards the south than towards the north end of the islands. At quite the southern extremity of Little Coco bare sandstone reefs, too shallow for the growth of a coral fringing-reef, stretch away south-eastward in much the same way as the well-known Alguada reefs extend southward off Cape Negrais. On the east coast of Little Coco are high coral reefs exposed at low-tide, fringed by a coral-shingle beach, while towards the north end of the island are similar high reefs fringed by a shore of sandy soil which, with the beach-forest growing on it, is being washed away by the sea. On the west coast, where the reefs are high, and, though still in the "pool" stage appear from their jagged edges to be approaching the "platform" stage, a line of low sand-dunes, perhaps the highest development of the epoch of sand-accretion, have been thrown up; these at present protect the shore and have actually closed up, at the south-west corner, the mouth of a mangrove-creek.

Similarly, in Great Coco, near the southern extremity and between the main island and Jerry there is a large bare sandstone reef which exhibits very well the arrangement and dip of the strata; further up the east coast denudation is going on, still further north the site of a beach-forest is being composed by accretion, while at the north end a mangrove forest is invading the sea. The west coast of Great Coco is more or less rocky and abrupt, for nearly the whole extent of the island.

No denudation is taking place in Table Island, the shores of which rise rather abruptly from the beach in most of its circumference, though there is a bay at the north side looking towards Slipper Island that is fringed with *Pemphis acidula* and has a small flat space immediately within its *Pandanus* fence.

When the beach between the reef and the *Pandanus* sea-fence consists of coral sand it is usual to find outside the jungle proper a belt of *Ipomœa biloba*, at times covered with parasitic *Cassytha ;* where it is composed of shingle *Ipomœa biloba* may also occur, though it is more usual to find its place taken by *Ipomœa denticulata.* Along with these *Ipomœas* occur *Euphorbia Atoto* and, less frequently, *Sesuvium Portulacastrum.* Usually just within these occurs the common sea-face jungle-fence of *Pandanus*, *Sophora tomentosa*, *Cæsalpinia Bonducella*, *Tournefortia argentea*, *Desmodium umbellatum*, *Premna integrifolia*, *Clerodendron inerme*, *Colubrina asiatica*, *Canavalia obtusifolia*, *Vigna lutea*, *Guettarda speciosa*, *Allophylus Cobbe*, etc., and then, particularly if the beach is a shingle one, as trees in the same zone, *Ixora brunnescens*, *Terminalia Catappa*, very common, *Stephegyne diversifolia*, *Thespesia populnea*, *Hernandia peltata*, *Erythrina indica*, *Pongamia glabra*, *Ficus Rumphii*, *Barringtonia speciosa*, *Gyrocarpus Jacquinii*, etc., with a thin line of *Cocos nucifera* growing up slantingly beneath these and stretching their crowns seawards as if in search of light. Where the beach is sandy the sea-face jungle makes a less dense hedge, and within it lies a flat space of sandy soil with a grove of *Cocos nucifera*, stretching back from 10 to 100 yards to where, usually on lower and muddy ground tunnelled by *Cardisoma* and other land-crabs, commences a dense jungle that shades off almost insensibly into the vegetation of a true mangrove-swamp. The sand beneath the coco-nut trees in these groves is covered in Great Coco by a close sward of *Thuarea sarmentosa*, with here and there patches of *Ipomœa biloba*, clumps of *Tacca pinnatifida*, or large examples of *Crinum asiaticum* and *Cycas Rumphii*, and with patches of *Eranthemum* here and there beneath these. The more rocky portions of the coast have in the sea-face jungle-fence described above some other species that do not seem to care for sand or shingle, such as *Hibiscus tiliaceus*, *Tabernæmontana crispa*, *Desmodium polycarpon* and *Desmodium triquetrum*, *Briedelia*, *Derris uliginosa*, *Pluchea indica*, etc. Within the coco-nut zone on the flat land we meet with more *Gyrocarpus Jacquinii*, with the Andamanese Bullet-wood (*Mimusops littoralis*), various species of *Dipterocarpus*, *Miliusa* sp., common, and some species of *Meliaceæ ;* the climbing undergrowth in this tract is very characteristic, more so than the trees, consisting of *Cæsalpinia Nuga*, *Capparis sepiaria*, and, very largely, of *Pisonia aculeata*. In the more muddy soil which occurs on the outskirts of the mangrove-swamps other shrubs and creepers occur; such as *Leea sambucina* with stilted roots like the mangroves, *Cynometra ramiflora*, *Hibiscus tiliaceus*, *Flagellaria indica*, *Mucuna gigantea*, remarkably common, *Sarcostigma edule*, *Plecospernum andamanicum*, *Antitaxis calocarpa*, *Salacia prinoides*, which extends also into the swamp proper, *Acrostichum scandens*, etc. Not infrequent in such situations, when there is no high forest overhead is *Vitex Negundo* which is particularly common on Little Coco. In this muddy tract the tall trees remain much the same as in the drier area just behind the beach. Further inward the vegetation is that characteristic of a true mangrove swamp, *Bruguiera*, *Ceriops*, *Rhizophora*, *Aegiceras*, *Avicennia*. The *Avicennia*, strangely, does not appear to be common in many of the creeks, though there is one creek, on the east side and near the south end of Great Coco, in which it is the prevailing tree; except indeed for a few *Bruguiera gymnorhiza* trees along the open channel of the creek, the whole swamp consists of *Avicennia officinalis* with thousands of its curious roots protruding through the mud and water as described already in a former paper (*J. A. S. B.* vol. lix, p. 272); considering the situation and loose structure of these roots, which are of the consistence of *solah*-pith, there seems every possibility that they are concerned in the process of transpiration; the large area covered by the roots of each tree must also afford great stability to a species which affects, as this one does, the situation of the mangroves without having their stilted roots. In this particular swamp each tree was loaded with the climbing form of *Salacia prinoides* and, as the latter happened to be in flower at the time of the visit, the fœtid nature of the atmosphere experienced may be imagined.

Between the headlands, in most cases, a choked-up creek is to be found; generally this extends but a short way into the jungle, though sometimes it winds about on the level ground for a considerable distance as a mangrove-swamp. In two places the creeks on Great Coco are apparently open at all times to the tide; the chief creek is that which debouches at the north end of the island. There are no open creeks in the other two islands, though at the south-west corner of Little Coco what has been a creek of considerable extent is now converted into a large lagoon by a broad bank of sand having been blown and beaten up by the south-west monsoon into a firm embankment across its former outlet.

On the ridges the trees are much the same, as to species, as on the lower ground, except that the *Miliusa* which is common below is scarce there, and the *Gyrocarpus* is rather uncommon. The *Mimusops* too, is not so abundant on the drier ground. The *Pandanus*, however, especially on the western side of the islands, ascends to the tops of the ridges and along with the *Capparis sepiaria* occurs *Capparis oxyphylla* (*C. tenera*, var.), the other common creepers being *Lygodium flexuosum*, *Abrus precatorius*, *Mezoneuron enneaphyllum*, *Mucuna pruriens*, *Thunbergia laurifolia*, *Dioscorea* (two species), *Calamus* (two species) exceedingly abundant and making an almost impassable cane-brake especially on the crests of the ridges ; *Pæderia fœtida* is another common creeper, as also is *Modecca cordifolia*. The jungle with which these are associated contains, besides the shrubs met with on the lower ground, thickets of *Cyclostemon assamicus* and other Euphorbiaceous shrubs, *Alsodeia bengalensis*, *Glyptopetalum calocarpum*, *Grewia* (two species), *Diplospora singularis*, *Ficus* (several species), etc. On one hill, in Great Coco, there is a limited patch of bamboo-jungle, the species being a *Dendrocalamus*, probably a variety of *D. Strictus*. This species also occurs on Table Island, where flowering specimens were obtained, and at first there seemed to be room for doubt as to whether it might not have been introduced on the lighthouse-island, though certainly it only occurs there in the untouched jungle and no examples exist in the clearing. The presence of the same species, however, in quantity, in the interior of Great Coco, on a hill which it is hardly extravagant to suppose had not been before ascended by any one, may be held to dispose finally of the doubt. Among the features of the jungle on exposed sea-slopes that are *not* grass-clad must be noted the presence in quantity, besides the other creepers found on the ridges, of *Ipomœa palmata*, *Ipomœa grandiflora* and *Convolvulus parviflorus*, the latter a particularly characteristic species on the west coast. The herbaceous undergrowth consists of *Oplismenus compositus*, *Cyperus elegans*, and a few other sedges and grasses in local patches or as stray examples ; in places also occur patches of *Alocasia fornicata*, *Calanthe* sp. (apparently *C. veratrifolia*), *Dracæna spicata*, *Desmodium laxiflorum* ; in one place nearly in the centre of the island, some plants of *Urena lobata* (this species does not occur in the clearings of either island and cannot here be looked upon a weed introduced by human agency) ; in the drier parts considerable quantities of *Acrostichum appendiculatum ;* along the sides of dry torrents a good deal of *Adiantum lunulatum ;* and in one or two damp, flat spots *Ceratopteris thalictroides*.

On Table Island the west side has been artificially cleared and it is impossible to say that it ever has been jungle-covered, but several of the headlands on the west side of the Great Coco, as has already been mentioned, have naturally bare grassy slopes. There are none of these, however, on the Little Coco. The principal grass on these slopes, and throughout the two clearings as well, is the very uninviting *Andropogon contortus*, mixed with a small amount of *Ischæmum ciliare;* besides these there is some *Cyperus polystachyus*, and in the clearings of both islands *Eleusine indica* in tufts, with here and there a little *Panicum colonum*. In Table Island, though not in Great Coco, *Eleusine ægyptiaca* and *Panicum Helopus* have also become established. In this connection it should be mentioned that *Thuarea sarmentosa*, which is the common sward-grass under the coco-nut trees of Great Coco, is very rare in Little Coco; the only spot where the coco-nut zone is there of any width has *Ischæmum muticum* growing throughout it in abundance; in Great Coco *Ischæmum muticum* is rare.

On the low ground the epiphytes in the taller trees are two species of *Hoya*, *Scindapsus officinalis*, *Dendrobium secundum* (the only common light-loving orchid, which is particularly common on trees of *Heritiera littoralis*, etc., about the mouths of creeks), *Davallia solida*, *Polypodium* (*Niphobolus*) *adnascens*, and *Polypodium quercifolium*. There is a great absence of epiphytes from the trees growing in the interior, the ferns mentioned are in particular confined to the trees nearest the sea. In the muddy ground behind mangrove-swamps there are on the stems of *Cynometra* and other trees, great numbers of an orchid that proves, on having been flowered in the Calcutta garden, to be a *Dorites* with violet flowers; apparently, however, it is only a variety of *D. Wightii*.

Perhaps a better idea of the vegetation of the islands may be obtained if extracts from the writer's notes, enumerating the species met with in particular localities, be given. Of these only a few are selected, illustrative, as far as possible, of different kinds of soil and of diverse situations. From these it will be seen that any attempt to divide the forest into distinct zones and regions is attended with difficulty, since the various forests—*Mangrove*, *Beach*, *Mud-flat*, and *Dry-ridge* jungles—merge into each other on every hand.

In crossing the island on the drier level ground near the south end of the island one finds after the belt of coco-nuts, which is there about 100 yards wide on the western side, a jungle at first not very dense of *Canarium commune*; *Aglaia andamanica*; *Miliusa* sp.; *Gyrocarpus Jacquinii*, very common; *Mimusops littoralis*, the most common tree, with often great masses of *Hoya*, and near the sea with *Polypodium quercifolium* as epiphytes—all the *Mimusops* here is uniformly dying back in the topmost branches; *Bombax* sp., looking much more like *B. malabaricum* as to leaves than like the Andaman species identified by Kurz with *B. insigne*; *Dracontomelum sylvestre*; *Spondias mangifera;* *Semecarpus heterophylla*; *Albizzia procera*; *Dipterocarpus* sp.; *Sterculia alata*; *Erio-*

dendron anfractuosum, etc. Under the *Cocos nucifera* on the sandy soil a sward of *Thuarea sarmentosa* with patches of *Ipomœa biloba* and with a quantity of *Eranthemum succifolium*; further inland there is a dense undergrowth of *Glycosmis pentaphylla*; *Ardisia humilis*; *Ficus brevicuspis* and *Ficus Dæmonum*; *Alsodeia bengalensis*; *Glyptopetalum calocarpum*; *Cyclostemon assamicus*; etc.—covered with a mass of *Pisonia aculeata*; *Cæsalpinia Nuga*; *Capparis sepiaria*; *Mucuna gigantea*, less common here than on muddy soil; *Calamus* sp., not very common; *Sarcostigma edule*; *Antitaxis calocarpa*; *Derris scandens*; *Thunbergia laurifolia*; *Dioscorea*, two sp.; *Vitis pedata*, very common; *Acacia rubricaulis*, often. Of sub-herbaceous plants may be mentioned *Dracœna spicata*, it is, however, less common on level ground than on the ridges. Further on were met with *Cynometra ramiflora*, with occasionally *Dorites Wightii* epiphytal, but less commonly so than where the soil is moist and muddy; considerable quantities of *Leea sambucina*; *Sterculia villosa*, as a small tree; *Stephegyne diversifolia*, though rarely; *Artocarpus Gomeziana*; *Terminalia bialata*; some *Siphonodon celastrineus*; *Oroxylum indicum*; and, as the opposite side of the island is approached, *Croton sublyratus*; *Hernandia peltata*; *Sterculia rubiginosa*; *Terminalia Catappa*; *Erythrina indica*; and the *Pandanus* sea-fence. Just before reaching this coast-zone a single example of a stemless palm (*Livistona* sp. ?) was met with; another example of this was obtained on the hill where the 1889 encampment was made at the north-east corner of the island. In cutting a path across the island at another point a level sandy tract was reached on which for several hundred yards grew nothing except young *Gyrocarpus Jacquinii*.

Crossing at a point where a ridge had to be passed it was found that much of the flat land behind the coco-nut zone was taken up with a jungle of *Gyrocarpus Jacquinii*, *Macaranga Tanarius* and *Mallotus andamanicus* to the exclusion of other species; but even as far as the base of the ridge many fruits of *Cocos nucifera* that had been floated inland during the rainy season, when the whole of this level tract is evidently water-covered, are germinating freely and some coco-nut trees that have reached the light have begun to bear. On the ridge itself a dense jungle prevails, much matted, especially along the crest, with creepers; the chief of these is *Thunbergia laurifolia*, the others being *Dioscorea* sp.; *Capparis sepiaria* and *Capparis tenera*; *Derris uliginosa*; *Anodendron paniculatum*; *Abrus precatorius* and *A. pulchellus*; *Calamus*; *Pædiria fœtida*; *Modecca*; *Trichosanthes palmata*; *Porana spectabilis*; a little further along this ridge the west side and the flat land at its base was found to be a dense thicket of *Caryota sobolifera*; the herbaceous undergrowth was remarkably sparse and consisted of a few plants of *Zingiber* sp.; some patches of *Alocasia*, and a few patches of *Oplis-*

menus. The eastern side of this ridge had no flat land between it and the sea and was rather more open, the tall trees and creepers were much as on the west side, with the addition of *Argyreia tiliæfolia* and *A. Hookeri*; large masses of *Erycibe paniculata*, which is here always a heavy climber and not shrubby; and among the undergrowth with the addition of *Claoxylon* sp.; *Corypha* sp.; and near the shore *Blachia andamanica*; *Pluchea indica*; *Cnesmone javanica*. On bare isolated rocks lying well out on the reefs, and never covered completely by the tide, the species found are always *Fimbristylis* sp.; *Cyperus pennatus*; and *Bœrhaavia repens*. The same species also occur on bare rocky patches of the coast all round the island but especially on the west coast. Other species associated with these in such situations are *Desmodium polycarpon*; *D. triquetrum*; *Blumea virens*; *Vernonia divergens*; *V. cinerea*; *Pluchea indica*, etc.

The isthmus uniting the outlying peninsula at the north-east corner with the main island has, mixed with the coco-nut trees occurring there, a sparse forest of *Mimusops* and *Dipterocarpus*, with an undergrowth towards the north coast almost exclusively of *Macaranga Tanarius*, towards the south almost entirely of *Dodonæa viscosa*, though here and there on hummocks of soil as opposed to sand, are other trees, like *Oroxylum indicum*; *Heterophragma adenophyllum*, etc. Among the herbaceous species here the most noteworthy is *Anisomeles ovata*, the only *Labiate* on the islands, which is, however, at this particular spot, very plentiful. On the coast of the north-east peninsula *Physalis minima* is a common species, it occurs, however, in similar situations here and there on both the Great and the Little Coco; on the slope above *Strobilanthes phyllostachyus* is gregarious and plentiful, as it likewise is at the north end of Little Coco in a similar situation.

As an example of the vegetation of level ground, where the soil is shingle instead of sand, the north end of Jerry island may be described. Here on the beach is a dense thicket of *Pemphis acidula*; behind this, a few examples of *Pandanus odoratissimus*; many *Scævola Kœnigii*; some *Tournefortia argentea* and *Sophora tomentosa* bushes; many coco-nut trees; much *Cæsalpinia Bonducella*. Behind this sea-fence the shingle is covered with a mass of *Ipomœa biloba*, a striking contrast to what occurs at the north-east corner of the island where the shingle has *I. denticulata* only. The trees on this shingle are *Terminalia Catappa*, *Cocos nucifera*, *Ardisia humilis*, *Ixora brunnescens*, *Guettarda speciosa*, *Macaranga Tanarius*, *Mimusops littoralis*, *Gyrocarpus Jacquinii*, *Hernandia peltata*. Besides the *Ipomœa* the only herbaceous vegetation consisted of a few fruiting *Amorphophalli*; the tubers of these brought to Calcutta have since sent up bulbiferous leaves that shew the species to be nearly related to, but probably quite distinguishable from, *A. bulbifer* and *A. tuberculiger*, the two species hitherto known which exhibit this character. The east side of this island has *outside* the *Pandanus* fence, which is there about three times as broad and thick as on the west, a belt of *Thespesia populnea* and *Guettarda speciosa*, with patches of *Pemphis acidula* and *Clerodendron inerme*, and some trees of *Cordia subcordata* and *Champereia Griffithiana* as well as a few thickets of *Vitex Negundo* and *Desmodium umbellatum*.

The sandy isolated spit on the reef between Great Coco and Jerry Island is not covered even by spring-tides—it is about 70 feet long from north to south by some 30 feet across, and at the time of the writer's visit there could be counted on it (mostly near the east side, and towards the south end) about a dozen germinating coco-nuts; three seedling *Hibiscus tiliaceus*, a seedling *Thespesia*, some seedlings of *Gyrocarpus*, four seedling *Mucuna*, two seedling *Erythrina*, six seedling *Carapa moluccensis*, one seedling *Barringtonia speciosa*, one seedling *Entada scandens*, some young *Ipomæa biloba*, and one young *Cynometra*, with two or three other species not recognised.

In general features Little Coco so greatly resembles the other islands that it is unnecessary to deal with it in detail. The chief feature is perhaps the great abundance of *Corypha elata* and *Siphonodon celastrineus;* still both species were met with, though sparingly, on the Great Coco.

Before concluding, however, this general account of the vegetation of the islands the two fresh water accumulations deserve to be more particularly noted. That on the Great Coco consists of a small lake in the narrow neck of land that joins the outlying north-eastern peninsula to the rest of the island. This lakelet is about 300 yards long and hardly 100 yards wide, with its longer diameter *across* the isthmus. Its depth is a little over 3 feet; it is uniformly deep from side to side and from end to end, with a hard, even bottom. At either end it is only separated from the sea by some 80 to 100 yards of shingle bank, and it seems difficult to understand why the water it contains does not ooze out, and how it is that it is unaffected by the adjacent salt water, since the bottom of the lake is lower than the point reached by the waves that beat up on the single beach, if not actually lower than the level of the highest tides. The bottom seems to be no more than the floor of what has formerly been a shallow bay on the fringing-reef, and the shingle banks which separate it at either end from the sea seem to be nothing more than the ultimate embankments that would result when the causeways connecting outlying islets with the main island are so enlarged by accretion as to cease to be covered by the tides. This postulates that the present outlying north-eastern peninsula had originally been detached from the main island and, being an islet of considerable width, that a causeway, ultimately becoming an embankment, has been thrown up by wave-action from each of the two adjacent bays. Soil washed down from the adjacent slopes during the rainy season has in the form of fine silt closed up the porous shingle banks at either end till these can now retain the fresh water within them and prevent the percolation of sea-water from without. To the east side of this lake there is a small flat meadow covered with *Kyllinga* and *Fimbistylis* along with some *Cyperus polystachyus* but very little grass. Whether this meadow was originally a naturally bare patch or is only part of the clearing made in connection with the abandoned settlement on the adjacent hill it is difficult to say. If, however, it was artificially cleared, it is unlike the rest of the clearing in this, that no woody jungle is reappearing in it now. At the time of our visit a number of snipe frequented the meadow. Close to the edge of the lake is a continuous belt of *Hygrophila quadrivalvis;* within this, and extending into the water, is a belt of *Polygonum* all round the margin of the lake; inside the *Polygonum* float large matted patches of *Panicum Myurus.* Here and there are patches *Limnanthemum indicum;* there is also a considerable quantity of *Nymphæa rubra.* The ordinary white *Nymphæa Lotus,* so common in similar spots in the Andamans, is not present, a circumstance which inclines one to think that this red water-lily may have possibly been introduced during the attempt to settle in the island. The water is quite potable and apparently wholesome; neither *Chara* nor *Zanichellia* is present, perhaps the water is rather deep for these.

Very different in many respects is the lagoon on Little Coco which is simply a mangrove creek that has been banked off from the sea by a small sand-dune having been thrown up across its mouth. It is not more than 1½–2 feet deep anywhere, with also a level but at the same time a softer bottom than the Great Coco lake, and this bottom is covered uniformly throughout by a meadow of *Chara* mixed with *Zanichellia.* Here the water, though perhaps potable on an emergency, and though used by native craft that call in for it, is slightly brackish, and the lake is fringed throughout by *Bruguiera, Lumnitzera, Ceriops, Avicennia,* etc., while clumps of similar mangrove trees occur throughout it. Its area is considerably greater than that of the Great Coco lake, for it is about a quarter of a mile long and a furlong across at the widest part; it was haunted at the time of our visit by teal. Here, curiously enough, *Panicum Myurus* does not occur, its place being taken by *Paspalum scrobiculatum* which floats in great patches at its south-western corner. There is no *Limnanthemum* and the *Nymphæa* present is, as in the Andamans in such situations, the common *N. Lotus* and not, as in the Great Coco, the red-flowered variety. On the banks and extending into the water are considerable beds of *Scirpus subulatus* which does not occur in the other lake. Here on the other hand there is neither *Polygonum* nor *Hygrophila* present.

Beyond the coco-nuts the vegetable products of the island can hardly be very highly assessed. *Mimusops littoralis* (Andamanese Bullet-wood) is common and so is *Lagerstrœmia hypoleuca* (Andamanese Pyen-ma); *Ptercarpus indicus* (Padouk) is rare however; and even of second- or third-rate timber trees such as *Diospyros Kurzii* (Zebra-wood); *Dipterocarpus* sp. (Wood-oil trees); *Heritiera* (Sundri); there is no great quantity; the only bamboo found (*Dendrocalamus strictus* VAR ?) is not very valuable and is not abundant; while the only abundant natural grass (*Andropogon contortus*) is so uninviting that the cattle on the island prefer eating *Pandanus* leaves to grazing it.

In the subjoined list of the species obtained during the two visits (which must not, however, be considered complete, though it may safely be assumed to be representative of the vegetation of the islands), it will be seen that a number of species are undetermined. As a matter of fact they are probably mostly species hitherto undescribed, but owing to the shortness of time at the writer's disposal, and owing to both the visits being at the same season of the year, it was impossible to obtain complete material of these, and it has therefore been impossible to prepare for them specific descriptions. In some cases roots or seeds of these have been brought to Calcutta and are now in cultivation there, so that their identification will, it is hoped, only be a matter of time.

In presenting this list the writer wishes to acknowledge much kind assistance received by him in its preparation; as regards *Phanerogams*, from his friends Mr. W. B. Hemsley, F. R. S., who has kindly compared a number of the more critical specimens at Kew; Mr. J. F. Duthie, F. L. S., who kindly assisted him in naming the grasses, and Mr. J. S. Gamble, F. L. S., who examined the solitary bamboo; and as regards *Cryptogams*, from Dr. G. King, F. R. S., who kindly assisted him in determining the *Ferns;* Mr. G. Massee, F. L. S, who, through the good offices of Mr. Hemsley, kindly named the *Fungi* and supplied the description of a new species of *Xylaria;* and Mr. G. R. Milne Murray, F. L. S., who, through the intervention of Dr. King, most kindly examined the *Algæ*.

The list is followed by an analysis indicating its systematic, its physical, and its phytogeographic nature.

§ § LIST OF PLANTS COLLECTED IN THE GREAT COCO, LITTLE COCO AND TABLE ISLAND.

PHANEROGAMÆ.

THALAMIFLORÆ.

ANONACEÆ.

1. MILIUSA sp.

Great Coco; Little Coco; very common in both islands.

The specimens obtained are in fruit only; the leaves are glabrous but otherwise are much like those of *M. Roxburghiana;* the fruits are very like those of *M. macrocarpa.*

MENISPERMACEÆ.

2. CYCLEA PELTATA H. f. and T.

Great Coco; common.

Burma, Nicobars. Not previously recorded from the Andaman group.

3. ANTITAXIS CALOCARPA Kurz.

Great Coco; common.

Andamans, Nicobars.

NYMPHÆACEÆ.

4. NYMPHÆA LOTUS Linn.

Great Coco; plentiful in the small lake at the north-east corner of the island—only the red flowered form (*N. rubra* Roxb.). Little Coco; sparingly in the lake at the south-west corner of the island—only the white form (*N. Lotus* Linn.).

This species is not included in any Andamans list and Kurz (*Report on the Vegetation of the Andamans,* p. 15) comments on the absence of NYMPHÆACEÆ. As a matter of fact this species does occurs in the Andamans; as does *Barclaya longifolia. Nymphæa Lotus* is very plentiful everywhere about the settlement at Port Blair, and in one arm of a creek that had been shut off from the tide by a bank of earth only three months before, the writer in December 1890 found hundreds of seedling plants already springing up. The lake in which it occurs on Little Coco is only a mangrove creek naturally closed from the sea by a sand-bank and the water is still slightly brackish; the vegetation around consists of *Bruguiera, Lumnitzera, Ceriops, Avicennia,* and other mangrove swamp species.

CAPPARIDEÆ.

5. CAPPARIS SEPIARIA Linn. *var.* GRANDIFOLIA Kurz Mss. ex Prain, Jour. As. Soc., Beng., lix, Pt. 2, p. 275.

Table Island; Great Coco; Little Coco. Very common everywhere in the group, both on ridges and flat land.

Diamond Island (Arracan); Andamans; Java; Bali; Madura.

6. CAPPARIS TENERA Dalz. *var.* LATIFOLIA H. f. and T. (*C. oxyphylla* Wall.)

Table Island; Great Coco; Little Coco. Very common everywhere in the group, but only on ridges.

Tenasserim; Andamans (Middle Island and South Island).

VIOLACEÆ.

7. ALSODEIA BENGALENSIS Wall.

Table Island; Great Coco; Little Coco. One of the commonest undershrubs in the group.

Silhet, rare; Martaban, frequent; Andamans, very common everywhere; Nicobars, very rare.

GUTTIFERÆ.

8. GARCINIA ? sp.

Great Coco.

An altogether doubtful plant represented by one leaf specimen among the plants collected by Mr. Kurz in 1866; nothing resembling it was met with in 1889 or 1890. Mr. Kurz did not himself collect in Great Coco. A deputation that visited the island while he was at Port Blair brought him a few specimens; there may even be some confusion as to the locality—the deputation visited Narcondam and elsewhere as well as the Cocos.

9. CALOPHYLLUM INOPHYLLUM Linn.

Little Coco. In beach-forests on shingle behind the sea-face vegetation, not common.

Shores of India, Andamans, Nicobars, Burma, Malaya, Polynesia, Australia, and E. African islands.

DIPTEROCARPEÆ.

10. DIPTEROCARPUS PILOSUS Roxb. ?

Great Coco; eastern coast, inland from Ford Bay, common. Only leaf specimens obtained and it is not impossible that they may belong to *D. Griffithii*, Miq.

11. Dipterocarpus alatus Roxb.
Great Coco; common. Little Coco; infrequent.
Chittagong, Burma, Tenasserim, Andamans.

MALVACEÆ.

12. Sida acuta Burm.

Table Island; cleared hillsides near lighthouse.

A cosmopolitan tropical weed.

13. Urena lobata Linn.

Great Coco; in one spot only, in interior of island.

A cosmopolitan tropical weed, introduction in this case may be attributed to bird agency. It hardly seemed to be indigenous as there were where it was gathered only a few plants. Yet human agency appears impossible: the species is not present at the north-east of Great Coco where once a small clearing was made, nor on Table Island where there is now a large clearing. It does not seem to be present in the Little Coco.

Cosmopolitan in the tropics.

14. Hibiscus Sabdariffa Linn.

Great Coco only; as if spontaneous in the small clearing; one of the few remains of a garden that existed during the short time an attempt was made to settle in the island; the few plants seemed unhealthy.

Cultivated in the tropics.

15. Hibiscus Abelmoschus Linn.

Table Island only; common throughout the clearing, escaped from cultivation.

Cosmopolitan in the tropics.

16. Hibiscus tiliaceus Linn.

Table Island; Great Coco; Little Coco; common, especially on the western coast, also plentiful at times in muddy flats behind mangrove swamps. A stunted almost glabrous form occurs on coral-shingle on Jerry Island.

Littoral species, cosmopolitan in the tropics.

17. Thespesia populnea Corr.

Very common on all the islands.

Littoral species on all tropical coasts in eastern hemisphere, introduced into West Indies.

18. Bombax insigne Wall.? *vars.*—??

There are two forms of *Bombax* present in the islands:—

1. A *tree* with armed trunk and branches; *leaflets* about 6, entire, narrowly lanceolate 5–8 inches long, 1–1½ inches wide, gradually tapering to both ends almost sessile, *stamens* numerous. This is com-

mon in all the islands, and if the writer is correct in considering the character of armed or unarmed trunk a trivial one, is the common *Bombax* in S. Andaman. The leaves suit exactly, and though in S. Andaman the trunk of old tall trees is smooth, young saplings are armed, as are the ultimate branchlets even of old trees. The leaves are unlike any of the Indian or Burmese gatherings either of *Bombax malabaricum* or of *Bombax insigne.*

2. A *tree* with unarmed trunk and branches, *leaflets* about 6, entire, obovate, acuminate 9–11 inches long, $2\frac{1}{2}$–3 inches wide, gradually tapering into petiolules $\frac{1}{2}$–$\frac{3}{4}$ inches long, *stamens* numerous. This was obtained only in Little Coco, it occurs in South Andaman also, for there are specimens at Calcutta, obtained by Mr. Kurz at Port Monat on the west coast. It does not at all resemble as to leaves of the other form nor does it resemble the leaves of Wallich's type specimen of *B. insigne.* But its leaves precisely resemble those of *Wall. Cat.* 1840/4 (from Taong Doung, Burma), which was issued as *B. malabaricum* VAR. *albiflorum*, Wall. The number of stamens makes it impossible to refer the Andaman plant at least to *B. malabaricum.*

In South Andaman both forms have the leaves *glaucous* beneath; in the Cocos neither form has; so that this character perhaps cannot be held as valid. Mr. Kurz did not consider the two Andamans forms separable from each other, and in one place he referred them to *B. malabaricum*, but afterwards, on account of the staminal character, united them to *B. insigne.* He has, however, left a manuscript name "*B. heterophyllum,*" which proves both that he had noted the existence of the two kinds of foliage and that he could not separate the plants exhibiting them from each other.

It should be noted that the convicts and others at Port Blair distinguish two kinds of "Semul" or "Cotton-tree." The distinction does not, however, apply to the two forms referred to above, but to these two taken together and to the following species.

Both islands.
South Andaman. Burma?

19. ERIODENDRON ANFRACTUOSUM DC.
Both islands, common.
India, Burma, Malaya, Africa, and America.

STERCULIACEÆ.

20. STERCULIA VILLOSA Roxb.
Great Coco; Little Coco.
India.

21. Sterculia rubiginosa Vent. *var.* glabrescens King.
Great Coco.
A variety restricted to the Andamans and Nicobars.

22. Sterculia parviflora Roxb.
Little Coco; only leaf specimens which, however, agree with some from Penang.

23. Sterculia alata Roxb.
Both islands, frequent.
India, Burma, Malaya.

24. Sterculia colorata Roxb.
Great Coco.
India, Burma, Malay Archipelago.

25. Sterculia campanulata Wall.
Little Coco.
Burma, Andamans, Java.

26. Heritiera littoralis Dryand.
Great Coco; Little Coco; common in the creeks.
Littoral species on tropical coasts of eastern hemisphere.

27. Buettneria andamanensis Kurz.
Little Coco; common.
Andamans, Tenasserim.

TILIACEÆ.

28. Berrya Ammonilla Roxb.
Little Coco, frequent.
India, Ceylon, Burma, Andamans.

29. Grewia lævigata Vahl.
In all the islands, common.
India, Burma, Malaya, Australia, Africa.

30. Grewia calophylla Kurz.
Little Coco, common.
Andamans.

31. Grewia Microcos Linn.
Great Coco, infrequent.
India, Burma, China, Malaya.

Discifloræ.

RUTACEÆ.

32. Glycosmis pentaphylla Corr.
In all the Islands; both the arboreous and the shrubby form extremely common.
Throughout India, Indo-China, and Malaya.

BURSERACEÆ.

33. GARUGA PINNATA Roxb.
Great Coco; common.
India, Burma, Malaya.

34. CANARIUM EUPHYLLUM Kurz.
Great Coco; very common.
Andamans.

MELIACEÆ.

35. AGLAIA ANDAMANICA Hiern.
Great Coco, Little Coco; common. Flowers sweet-smelling.
Andamans.

36. AMOORA ROHITUKA W. & A.
Great Coco; common.
India, Burma, Malaya.

37. CARAPA MOLUCCENSIS Lamk.

Great Coco; rather uncommon. The form with obtuse leaves (*C. obovata* Bl.) only occasional in the creeks, but very frequent germinating along the beaches of all the islands. The form with ovate cordate acuminate leaves in two or three places on *rocky* parts of the eastern coast. Little Coco; in one place only (form=*C. obovata* Bl.)

38. CHICKRASSIA TABULARIS A. Juss.?

Great Coco; common. In leaf only, but evidently identical with the tree identified with this species by Mr. Kurz in *Reg. Veg. Andam.*, p. 33.

OLACINEÆ.

39. CANSJERA RHEEDII Gmel.
Great Coco; a common climber.
India, Burma, Malaya, N. Australia, S. China.

40. PHLEBOCALYMNA LOBBIANA Mast.
Little Coco.
Tenasserim and Martaban.

41. SARCOSTIGMA WALLICHII Baill. (*S. edule* Kurz.)
Great Coco; rather common.

Andamans. Mr. Kurz has in the Calcutta herbarium suggested the reduction of his own species to S. Wallichii *Baill.*, a plant from the Salween valley, nor is there any character by which the two can be distinguished.

CELASTRINEÆ.

42. GLYPTOPETALUM CALOCARPUM Prain, Jour. As. Soc. Beng., lx, 2, 209 —*Euonymus calocarpus* Kurz.

Common in all the islands, also reported from Narcondam (leaf specimens only, and the locality perhaps a mistake—the writer could not find the shrub in Narcondam). Very nearly related to *G. zeylanicum* Thwaites, from Ceylon and S. India, but easily distinguished by its shorter racemes, smaller flowers and hardly foveolate petals. The fruits and seeds are exactly as in *G. zeylanicum*. In this the leaves are always entire.

43. SALACIA PRINOIDES DC.

Great Coco; in creeks, an extensive climbing shrub, associated with *Avicennia officinalis*.

India, Burma, Malaya, Philippines.

44. SIPHONODON CELASTRINEUS Griff.

Great Coco, occasional; Little Coco, very common. A considerable tree.

Pegu, Penang., Java.

RHAMNEÆ.

45. VENTILAGO CALYCULATA Tulasne.
Great Coco.
India, Burma, Malaya.

46. ZIZYPHUS ŒNOPLIA Mill.
Great Coco, not at all common.
India, Burma, Malaya, N. Australia.

47. COLUBRINA ASIATICA Brogn.
Little Coco; coast at north end of island.
India, Ceylon; Burma, Malaya; N. Australia; S. W. Africa.

AMPELIDÆ.

48. VITIS PENTAGONA Roxb.
Table Island and Great Coco; common.
Chittagong, Arracan, Andamans.

49. VITIS CARNOSA Wall.
Common on all the islands.
India, Burma, Malaya.

50. VITIS PEDATA Wall.
Great Coco, and Little Coco; very common.
India, Burma, Malaya.

51. LEEA SAMBUCINA Willd.
Interior of all the islands, common.
India, Burma, Malaya.

52. LEEA HIRTA Roxb.
Great Coco.
India, Burma, Malaya.

SAPINDACEÆ.

53. **Erioglossum edule** Blume.
Both islands, on ridges, common.
India, Burma, Malaya, North Australia.

54. **Allophylus Cobbe** Blume.
Great and Little Coco; not uncommon along the western sea-face.
India, Burma, Malaya.

55. **Sapindus Danura** Voigt.
Great Coco.
Assam, Burma.

56. **Pometia tomentosa** Kurz.
Great Coco, common.
Indo-China, Andamans, Nicobars, Malaya, Ceylon.

57. **Dodonæa viscosa** Linn.
Great Coco; a small tree very common at the north-east corner of the island.
Cosmopolitan in the tropics.

ANACARDIACEÆ.

58. **Odina Wodier** Roxb.
Great Coco.
India, Ceylon; Burma, Tenasserim.

59. **Parishia insignis** Hook. f.
Great Coco; in leaf only.
Tenasserim, Andamans.

60. **Semecarpus subpanduriformis** Wall.
Great Coco only, but there rather frequent near the eastern coast.
Chittagong; *Gamble.* Arracan, in the Kolodyne valley, *Kurz*; on Boronga Island, *Kurz.* Originally this was known only from specimens grown in the Calcutta garden (introduced from Chittagong) distributed by Dr. Wallich (*Cat.* n. 987).

61. **Semecarpus heterophyllus** Blume.
Great Coco, interior, rather frequent; Little Coco, interior, extremely common.
Pegu, Tenasserim; Andamans, Nicobars; Sumatra, Java.

62. **Spondias mangifera** Willd.
Great Coco and Little Coco, very common in the interior of both islands; the fruits are yellow and extremely sour, but much eaten by the wild pigs (*Sus andamanensis*) which abound.
Tropical Asia; Mr. Kurz found this in S. Andaman also.

63. **Dracontomelum mangiferum** Blume.
Great and Little Coco, frequent: in leaf only.

Andamans, Nicobars; Malay Peninsula and Archipelago; Philippines and Fiji Islands.

MORINGEÆ.

64. MORINGA PTERYGOSPERMA Gaertn.

Great Coco; a few trees have been planted at the north-east corner of the island by the people of the attempted settlement; a large number of seedlings have already appeared though the introduction has been so recent.

India; indig. in North-West Himalaya, elsewhere cultivated in tropical countries.

CALYCIFLORÆ.

CONNARACEÆ.

65. CONNARUS GIBBOSUS Wall.

Great Coco.

Tenasserim, Malaya; Andamans.

LEGUMINOSÆ.

66. CROTALARIA SERICEA Retz.

Table Island; very common throughout the clearing; apparently introduced, as it was not found in Great Coco or Little Coco. This species does not seem to occur in the Andaman group proper; at Port Blair in S. Andaman *Crotalaria retusa* is the species that has been introduced and occupies similar localities.

India, Burma, Malaya.

67. DESMODIUM UMBELLATUM DC.

In all the islands, very common on the coast.

India, Burma, Andamans, Malaya, Philippines, Polynesia, Mascarene islands.

68. DESMODIUM TRIQUETRUM DC.

Table Island and Great Coco; very common on bare rocky slopes on west coast, occasional on higher ground in the interior; Little Coco, occasional in the interior.

India, Burma, Malaya, Andamans; Philippines; S. China.

69. DESMODIUM LAXIFLORUM DC.

In all the islands, rather frequent on the higher ground in the interior.

India, Burma; Andamans, Nicobars; Malaya.

70. DESMODIUM POLYCARPUM DC.

Table Island and Great Coco; very abundant on all the rocky slopes on the western coasts. This species has been referred to (*Jour. As. Soc., Beng.*, lix, pt. 2, p. 251) as perhaps introduced into the Andamans, because Mr. Kurz did not meet with it in 1866 when he explored a part of the group. But from what the writer has been able to note since, he is convinced that the species is indigenous in the Andaman group.

East Africa; Tropical Asia; Malaya, Philippines; China, Japan; Polynesia.

71. DESMODIUM TRIFLORUM DC.

Table Island, in the lighthouse clearing on grassy slopes. There is a white- and a red-flowered variety and both are equally common.

Cosmopolitan in the tropics.

72. ALYSICARPUS VAGINALIS DC.

Great Coco, in the small clearing at the north-east corner of the island, probably introduced.

Tropical weed indigenous in eastern hemisphere; introduced in America.

73. PHASEOLUS sp.

Great Coco. Appearing as seedlings in the droppings of the half-wild cattle on a bare grassy hill-side in the south-west of the island, much frequented by these, were seen during the second visit to the island numerous examples of what appears to be a species of this genus. Each leaflet has in the centre a reniform white mark which ought to be distinctive, yet the writer cannot recall a variety which exhibits this. The origin of the seeds could not be traced, no *Phaseolus* was observed in the abandoned clearing in 1889, and unfortunately it was impossible to re-examine that locality in 1890.

74. ABRUS PRECATORIUS Linn.

Great Coco, common; Little Coco, very common.

Cosmopolitan in the tropics.

75. ABRUS PULCHELLUS Wall.

In all the islands, very common.

Africa, India, Burma, Malaya, Andamans.

76. ERYTHRINA INDICA Lamk.

In all the islands, in coast zone; not nearly so common as it is on Diamond Island at the mouth of the Bassein river.

India, Burma, Malaya; Andamans, Nicobars.

77. MUCUNA GIGANTEA DC.

Great and Little Coco; one of the commonest climbers on flat land in the interior behind the mangrove swamps.

India, Andamans; Malaya; Philippines; Polynesia.

78. MUCUNA PRURIENS DC.

Table Island, very common, interior jungle on ridges.

Cosmopolitan in the tropics.

79. Pueraria Candollei Graham.
Little Coco, common.
Pegu, Tenasserim.

80. Pueraria phaseoloides Benth.
Great Coco, common on the western coast.
India, Burma, S. China, Malaya.

81. Canavalia obtusifolia DC. (*Dolichos lineatus* Thunbg.)
In all the islands, one of the commonest climbers along the sea-face here as on the Burmese, the Andamans, Nicobars and Malay coasts.
Cosmopolitan on tropical shores.

82. Vigna lutea A. Gray.
Little Coco, very common on coasts both east and west; Great Coco, rather rare.
Martaban, Malaya; Andamans, Nicobars.
Cosmopolitan in tropics, but absent from India.

83. Pterocarpus indicus Willd.
Great Coco, infrequent.
India, Burma, Andamans, Malaya; Philippines; S. China.

84. Derris scandens Benth.
Great and Little Coco; very common.
India, Burma, Andamans, Malaya; S. China, N. Australia.

85. Derris sinuata Benth.
Great Coco, extremely common on the eastern coast.
Pegu, Tenasserim, Malay Peninsula; Andamans, Malay islands; Ceylon.

86. Derris uliginosa Benth.
Both islands, common, on rocky parts of the coast.
India, Burma, Malaya, Africa, Australia, Polynesia.

87. Pongamia glabra Vent.
In all the islands, a common tree in the coast zone and especially along the sides of mangrove creeks; never seen climbing.
India, Burma, Andamans, Malaya; Polynesia; N. Australia; Seychelles.

88. Sophora tomentosa Linn.
Great and Little Coco, west coast, but infrequent.
Cosmopolitan on tropical sea-shores.

89. Mezoneuron enneaphyllum W. & A.
Great Coco, common on summits of interior ridges.
Cachar, Chittagong; Pegu, Tenasserim, Ceylon, Malay Archipelago.

90. Cæsalpinia Bonducella Flem.
In all the islands, very common in the sea-face jungle along the beaches.
Cosmopolitan in the tropics.

91. CÆSALPINIA NUGA Ait.

In all the islands; very common in the jungle on flat land behind beaches and mangrove-swamps.

India, Ceylon; Burma; Malaya; Philippines; N. Australia; S. China; Polynesia.

92. TAMARINDUS INDICA Linn.

Great Coco; a single large tree on west side of mouth of creek opening into Pollok Bay. This tree grows in a place where it could hardly have been planted; if planted where it grows it can hardly be imagined for what object the position was selected and the tree is obviously much older than the last attempt at settlement in the island. This bay is at certain seasons an anchorage for Burmese junks calling to obtain coco-nuts and the introduction of the tree is probably due to a tamarind fruit having been cast overbroad from one of thess junks and thrown up by the tide where the tree now grows.

Throughout the tropics, cultivated; perhaps indigenous in Africa.

93. CYNOMETRA RAMIFLORA Linn.

In all the islands; very common in flat, muddy lands behind mangrove swamps.

India, Ceylon; Burma, Andamans, Nicobars, Malaya; Philipines; N. Australia.

94. ENTADA SCANDENS Benth.

In all the islands, frequent; its seeds occur in all the shore-drifts and it was one of the species found germinating on a sandy spit (an incipient island) between Jerry Island and the south end of Great Coco.

Cosmopolitan in the tropics.

95. ADENANTHERA PAVONINA Benth.

Table Island and Great Coco, common.

India, Ceylon; Burma, Andamans, Malaya; Philippines; S. China.

96. ACACIA CONCINNA DC.

Great Coco, rather common.

India, Ceylon; Burma, Malaya; S. China.

97. ACACIA PENNATA Willd.

In all the islands, very common.

Africa; India, Ceylon; Burma, Andamans, Malaya.

98. ALBIZZIA LEBBEK Benth.

Great Coco.

Africa; India, Ceylon; Barma, Tenasserim, Malaya: Andamans; China; N. Australia.

99. ALBIZZIA PROCERA Benth.

In all the islands exceedingly common on the interior ridges; stunted and weatherbeaten where it approaches the west coast.

India, Burma, Malaya, Philippines, (not yet recorded from south Andaman).

RHIZOPHOREÆ.

100. Rhizophora mucronata Lamk.
Great and Little Coco, frequent in mangrove swamps.
Tropical shores of Africa, Asia, and N. Australia.

101. Rhizophora conjugata Linn.
Great Coco, common.
Tropical shores of Asia, and Africa.

102. Ceriops Candolleana Arn.
Great Coco, common.
Tropical shores of Eastern Hemisphere.

103. Ceriops Roxburghiana Arn.
Great Coco, not common.
Tropical shores of Eastern Hemisphere.

104. Bruguiera gymnorhiza Lamk.

In all the islands, common. This is the chief constituent of the mangrove jungle in the group; it germinates very freely also along the sandy beaches though there it doubtless does not persist; it also germinates along the ridges of coral that are formed between the mainland and small outlying islets like Lascelles Island, Rat Island, Button, and others, and as the roots spread they help to collect the "drift" of the tides and shew how it is possible for the island to increase in size without postulating a general upheaval for the group. On bare rocky promontories on the west coast where long rocky ledges and reefs of loose boulders run many yards out to sea, numbers of seedlings also appear and though these spots are exposed to the full force of the south-west monsoon many of these resist the waves for at least several seasons; the only other constituent of the mangrove jungle that does this is *Avicennia*, many specimens of which though dwarf and weatherbeaten are evidently of considerable age. *Pemphis*, which also greatly affects such positions is not partial to mangrove swamps proper at all and was never seen along the creeks. In the small lake on Little Coco the water of which was potable though not good almost all the constituents of a mangrove swamp were growing freely.

Tropical shores of Eastern Hemisphere and Polynesia.

COMBRETACEÆ.

105. Terminalia Catappa Linn.

In all the islands; one of the commonest trees on the shore and not infrequent in the interior on flat lands, but not met with ascending the ridges. There is apparently no such species as *T. procera*.

Andamans, Malaya; planted elsewhere in the tropics.

106. TERMINALIA BIALATA Kurz.

Great Coco, frequent.

Burma, Tenasserim, Andamans.

107. LUMNITZERA RACEMOSA Willd.

Little Coco, very common among mangroves in the lagoon.

Tropical shores of Eastern Hemisphere and Polynesia.

108. ILLIGERA CONYZADENIA Meissn.

Great Coco, a rather common climber.

Tenasserim, Andamans.

109. GYROCARPUS JACQUINI Roxb.

In all the islands, probably the commonest species in the group.

Tropical sea-shores of the old world and Polynesia.

MYRTACEÆ.

110. BARRINGTONIA SPECIOSA Forst.

In all the islands, very common.

Ceylon; Andamans, Nicobars; Malaya; Australia; Polynesia: on sea-shores.

111. BARRINGTONIA RACEMOSA Blume.

In all the islands, very common.

India, Ceylon; Burma, Malaya; Andamans, Nicobars; Polynesia: on sea-shores.

MELASTOMACEÆ.

112. MEMECYLON EDULE Roxb.

Great Coco; east coast, on rocky promontory at south end of Ford Bay—only one tree seen.

Andamans, Malaya, Philippines. Mr. Kurz has a specimen from Great Coco also, only in leaf, and has it from S. Andaman in flower.

LYTHRACEÆ.

113. PEMPHIS ACIDULA Forst.

In all the islands; very common, especially on the west coast on rocky or shingly promontories.

Tropical shores of Eastern Hemisphere.

114. LAGERSTRŒMIA HYPOLEUCA Kurz.

Great Coco, common in the interior.

Andamans.

115. Lagerstrœmia sp.

Little Coco ; one tree only seen.

A tall straight tree, about 100 feet, leaves sessile, oblong-lanceolate 8 in. long, 2¼–2¾ in. wide, thinly coriaceous, fruit ½ in., calyx woody, lobes spreading.

The leaves of this are unlike those of any Indian species ; the fruit is very like that of *L. calyculata* Kurz, from Martaban, but the leaves are very different, being larger, much thinner, and perfectly glabrous. This, when flowers are found, will almost certainly prove a distinct species.

PASSIFLOREÆ.

116. Modecca cordifolia Blume (fide Masters).

Great Coco, common.

Andamans ; the specimens are exactly like the common Andaman coast *Modecca* and the flowers appear not to differ from those of *M. cardiophylla* Mast.

117. Carica Papaya Linn.

Great Coco, introduced but perfectly naturalised and already extending in an unbroken line among the coco-nuts on the east coast, from the north-east corner to within 3 miles of the south end of the island ; one or two isolated specimens occur at the south-east corner evidently originating from fruits washed up by the sea. Half a mile from the south end on the west coast is another spot, well into the interior, where some trees occur—the result apparently of independent introduction as they occur near the remains of some huts used by coco-nut gatherers who visit the island at intervals.

Cultivated in warm countries ; originally American.

CUCURBITACEÆ.

118. Trichosanthes palmata Roxb.

Little Coco ; near north end of island.

India, Ceylon ; Burma, Andamans ; Malaya ; N. Australia ; China, Japan.

FICOIDEÆ.

119. Sesuvium Portulacastrum Linn.

In all the islands ; common on sandy beaches on the east coast.

All tropical and sub-tropical sea-shores.

COROLLIFLORÆ.

RUBIACEÆ.

120. STEPHEGYNE DIVERSIFOLIA Hook. f.

In all the islands, extremely common.

Chittagong, Burma, Tenesserim ; Philippines.

121. MUSSÆNDA CALYCINA Wall. (*M. macrophyllæ* forma distinctior).

In all the islands very common. The calyx-teeth in these examples are ¾ in. long and ¼ in. broad.

Pegu, Tenasserim, Andamans.

122. WEBERA KURZII Hook. f.

Little Coco ; common in interior.

Andamans.

123. RANDIA LONGIFLORA Lamk.

Little Coco, common.

Assam, Chittagong, Burma, Tenasserim, Malaya ; Andamans, Nicobars.

124. DIPLOSPORA SINGULARIS Korth.

In all the islands, extremely common.

Assam, Burma, Tenasserim ; Malaya. Not yet reported from other parts of the Andaman group.

125. GUETTARDA SPECIOSA Linn.

Great Coco, east coast ; frequent.

Cosmopolitan on tropical sea-shores.

126. IXORA GRANDIFOLIA Zoll. & Mor., *var.* KURZEANA Teys. & Binnend.

In all the islands, common in the interior jungle ; a small straggling shrub.

Nicobars. This is exactly like the type of Teysmann and Binnendyk's *I. Kurzeana*.

127. IXORA BRUNNESCENS Kurz.

In all the islands ; very common along the beaches. A fine tree, often 60–80 feet ; extremely unlike the preceding.

Andamans, Nicobars.

128. IXORA CUNEIFOLIA Roxb.

Little Coco ; infrequent.

Assam, Burma, Tenasserim.

129. PAVETTA INDICA Linn.

In all the islands, very common.

India ; Burma, Andamans ; Malaya ; S. China ; N. Australia.

130. MORINDA CITRIFOLIA Linn., *var.* BRACTEATA Roxb.

In all the islands, exceedingly common along the coast.

Laccadives ; Andamans ; Nicobars ; Sunderbuns ; Arracan.

131. PSYCHOTRIA ADENOPHYLLA Wight.

Very common in all the islands.

Assam, Pegu, Tenasserim; Andamans.

132. PÆDERIA FŒTIDA Linn.

Very common in all the islands.

India, Burma, Malaya.

COMPOSITÆ.

133. VERNONIA CINEREA Less.

Table Island, common in the clearing near the lighthouse; Great Coco, frequent in the small clearing at the north-east corner but also plentiful on bare rocks on the western sea-face of the island. Though probably an introduced plant in the two first situations, its appearance on the west coast, where it is extremely plentiful, indicates that it has also reached the island independently of human agency.

Tropical Asia, Africa and America.

134. VERNONIA DIVERGENS Benth.

Great Coco; plentiful on rocky promontory at north end of island.

India, Burma, Tenasserim.

135. ADENOSTEMMA VISCOSUM Forst.

Great Coco, on the western coast and at the north end of the island.

Cosmopolitan in the tropics.

136. AGERATUM CONYZOIDES Linn.

Table Island, common in the clearing near the lighthouse.

Cosmopolitan in the tropics; originally American.

137. BLUMEA VIRENS DC.

Great Coco, profuse on rocks on western sea-face; in one sheltered cove the stems were over 8 feet high.

India, Burma, Tenasserim (Mergui, *Griffith*).

138. PLUCHEA INDICA Less.

Great Coco, common on the coast.

India, Burma, Malaya, China; sea-shores.

139. WEDELIA SCANDENS C. B. Clarke.

In all the islands, common in the sea-fence jungle, a rather brittle woody climber with stems 30—50 feet long.

Tropical sea-shores of India, Burma, Malaya, Andamans and Nicobars.

GOODENOVIEÆ.

140. SCÆVOLA KŒNIGII Vahl.

In all the islands, very common in the coast zone.

India, Burma, Malaya, Australia, Polynesia; on sea-coasts.

MYRSINEÆ.

141. Ardisia humilis Vahl.

In all the islands, common in the beach forest.

India, China, Malaya.

142. Ægiceras majus Gaertn.

Great Coco; fruits seen in the sea-drifts on the coast; doubtless the species occurs frequently in the mangrove swamps, though no individual tree was met with.

Cosmopolitan on tropical sea-coasts.

SAPOTACEÆ.

143. Mimusops littoralis Kurz.

In all the islands; next to *Gyrocarpus Jacquini*, this (the Andaman Bullet-wood) is the commonest tree in the group.

In Jerry Island, off the south end of Great Coco, and for about two miles along the coast at the south end of Great Coco, nearly every tree that has attained a height of 80 feet presents from the sea the appearance of being dead. Closer inspection, however, shews that in many (perhaps most) cases only the whole of the main branches are dead, while about their bases or along the main trunk numerous close bunches of small branches have appeared, the leaves of which keep the trees still alive. The same thing is apparent at the south-west corner of Little Coco but is less striking because less extensive.

Andamans, Nicobars.

EBENACEÆ.

144. Diospyros Kurzii Hiern.

Little Coco; Great Coco, rare.

Andamans, Nicobars.

APOCYNEÆ.

145. Rauwolfia serpentina Benth.

Great Coco, common.

India, Burma, Tenasserim, Java; not previously reported from the Andamans.

146. Cerbera Odollam, Gaertn.

Great Coco, rare; in mangrove swamps.

India, Malaya, Andamans; China; Australia, Polynesia.

147. Ochrosia borbonica Gmel.

Little Coco, common; in beach forests.

Andamans, Malaya, Seychelles, Mascarene Islands.

148. TABERNÆMONTANA CRISPA Roxb.
In all the islands, very common along the west coast.
Andamans Nicobars, Diamond Island (off Arracan coast).

149. STROPHANTHUS WALLICHII A. DC.
Great Coco; a large climber, in leaf only.
India, Assam, Chittagong.

150. ANODENDRON PANICULATUM A. DC.
In all the islands.
India, Burma, Malaya, Philippines.

151. CHONEMORPHA MACROPHYLLA G. Don.
Little Coco, common.
India, Andamans, Malaya.

ASCLEPIADEÆ.

152. SARCOLOBUS GLOBOSUS Wall.
Great Coco and Little Coco; common in mangrove swamps.
Sunderbuns, Tenasserim, Malay Peninsula; Nicobars.

153. HOYA PARASITICA Wall.
Great Coco.
Assam, Khasia, Chittagong, Tenasserim, Malaya; Andamans.

154. HOYA DIVERSIFOLIA Blume.
In all the islands; extremely common.
Burma, Malaya.

155. DISCHIDIA NUMMULARIA R. Br.
Little Coco; not common.
Cachar, Chittagong, Tenasserim, Malaya, Andamans; Australia.

GENTIANACEÆ.

156. LIMNANTHEMUM INDICUM Thwaites.

Great Coco; abundant in the small lake at the north-east corner of the island; not in the lake on Little Coco and not previously reported from the Andamans. The lake is adjacent to the small clearing and the species may possibly be an introduced one in this locality.

Afghanistan; India, Burma, Malaya; Australia, Fiji; Mascarene islands.

BORAGINEÆ.

157. CORDIA SUBCORDATA Lamk.

Great Coco, a rather common tree in the beach-forests on the east coast.

Andamans, Malaya; Australia; Sandwich Islands.

158. TOURNEFORTIA ARGENTEA Linn. f.

Great Coco, very rare; Little Coco, extremely common on the western coast and in the beach-forests, where it often reaches a height of 35—40 feet with a trunk of sometimes a foot diameter.

Ceylon; Malaya, Andamans, Nicobars; Australia; Mauritius.

CONVOLVULACEÆ.

159. ERYCIBE PANICULATA Roxb.

Great Coco, very common in interior.

India, Burma, Tenasserim; Malaya; Andamans, Nicobars; Australia.

160. ARGYREIA TILIÆFOLIA Wight.

Great Coco; common on the coasts.

India; Andamans, Malaya; Philippines; near the sea.

161. ARGYREIA HOOKERI Clarke.

In all the islands, common.

Sikkim, Bhutan, Assam, Martaban.

162. ARGYREIA LANCEOLATA Choisy.

Great Coco: exactly=*Wall. Cat.* 1395.

Tenasserim, Andamans.

163. LETTSOMIA PEGUENSIS Clarke.

Little Coco.

Pegu, Tenasserim, Andamans.

164. IPOMÆA GRANDIFLORA Lamk.

In all the islands, very abundant on the coasts.

East Africa; India, Burma, Malaya, Andamans; Australia, Polynesia; introduced in America.

165. IPOMÆA COCCINEA Linn.

Table Island, rampant in the jungle near the lighthouse clearing; escape from the light-keeper's garden.

Native of America; cult., and a frequent escape, in tropical Asia.

166. IPOMÆA BATATAS Lamk.

Table Island, cultivated in the lighthouse garden.

Native of America; cult., in the tropics generally.

167. IPOMÆA DIGITATA Linn.

Great Coco, on the west coast, occasional.

Cosmopolitan in the tropics.

168. IPOMÆA DENTICULATA Choisy.

Great Coco, very plentiful at north end of island, but almost altogether restricted to the coral-shingle; at south end of island and on Little Coco, exceedingly uncommon.

Seychelles; Ceylon; Malaya, Andamans and Nicobars; Australia, Polynesia.

169. Ipomæa Turpethum R. Br.

Both islands, not uncommon.

India, Burma; Malaya; Australia, Polynesia; Mauritius, Seychelles.

170. Ipomæa biloba Forsk.

In all the islands, very common; affects principally the sandy beaches; in Jerry Island, however, grows on the shingle and occurs under rather dense jungle, from side to side of that island, at its north end.

Cosmopolitan on tropical sea-shores.

171. Convolvulus parviflorus Vahl.

In all the islands; very common in the jungle along the western sea-face.

Africa; India, Burma, Malaya, Andamans; Australia.

172. Porana spectabilis Kurz.

Great Coco.

Tenasserim, Andamans.

SOLANACEÆ.

173. Solanum Melongena Linn.

Table Island, cultivated in the light-house garden; Great Coco, plentiful and quite naturalised all over the clearing at the north-east corner of the island; remains of the garden.

Cult. in all warm countries.

174. Physalis minima Linn.

Great Coco; abundant on rocky parts of the coast just above limits reached by spray during storms, on east, north and west coasts; Little Coco, on rocks in similar situations at north end of island.

Cosmopolitan in the tropics.

175. Capsicum minimum Roxb.

Table Island, in clearing, occasional, escape from the light-keeper's garden; Great Coco, throughout the clearing very abundant; unlike *Solanum Melongena* this is not confined to the clearing but is extending into the jungle much as *Carica Papaya* is.

India and Malaya; cultivated and frequent as an escape.

SCROPHULARINEÆ.

176. Scoparia dulcis Linn.

Table Island and Great Coco; abundant in the clearings on both islands; introduced.

An American weed, now cosmopolitan in the tropics.

BIGNONIACEÆ.

177. OROXYLUM INDICUM Vent.

Little Coco, very plentiful at north-east corner of the island; Great Coco, rare.

India, Ceylon; Indo-China, Andamans; Malaya.

178. HETEROPHRAGMA ADENOPHYLLUM Seem.

In all the islands, very common.

Assam and Eastern Bengal, Burma, Tenasserim; Andamans.

ACANTHACEÆ.

179. THUNBERGIA LAURIFOLIA Lindl.

In all the islands, very common.

Arracan, Tenasserim, Malaya; Andamans.

180. HYGROPHILA QUADRIVALVIS T. And.

Great Coco, abundant in the wet ground at the margin of the small lake and forming a continuous ring outside the belt of *Polygonum* growing at the water's edge.

India; Andamans, Burma, Malaya.

181. STROBILANTHES PHYLLOSTACHYUS Kurz.

Great and Little Coco, a gregarious species common on most of the rocky promontories on the east coast of both islands.

Pegu, Tenasserim.

182. ERANTHEMUM ALBUM Nees.

Great Coco; common in the beach-forests.

Chittagong, Burma; Malaya; Andamans, Nicobars.

183. ERANTHEMUM CINNABARINUM Wall., *var.* SUCCISIFOLIA Clarke (E. SUCCIFOLIUM Kurz.).

Great and Little Coco; common in the beach-forest.

Nicobars.

These two species are recorded because in the large suite of specimens collected, some examples agree exactly with Andamans specimens named *E. album* by Dr. T. Anderson, and others agree exactly with the original specimens of Mr. Kurz's *E. succifolium*. But I do not think that there are really two species present. The plants are referred by Anderson to *E. album*, but are considered by Clarke a white-flowered fern of *E. cinnabarinum*, and are held by Kurz to be two distinct species. The original specimens of Kurz's *Eranthemum album*, T. And.? (314 of Nicobars list) I cannot, however, distinguish from those of *E. succifolium* (313 of that list).

184. RUNGIA PARVIFLORA Nees, *var.* PECTINATA Clarke.

Table Island; in the light-house clearing.

India, Burma, Andamans; a weed, introduced.

185. **Peristrophe acuminata** Nees.

Great Coco, very common on the east coast.

Tenasserim, Malaya; Andamans.

VERBENACEÆ.

186. **Lippia nodiflora** Rich.

Little Coco, in swampy ground at west side of island, plentiful.

Cosmopolitan in the tropics.

187. **Premna integrifolia** Linn.

In all the islands, very common on the coast.

India, Ceylon; Burma, Malaya; Andamans, Nicobars; on sea coasts.

188. **Premna** sp.

Great Coco; a climber common on the western sea-face, also obtained on Rutland Island.

In fruit only; almost certainly *P. obtusifolia.*

South Andaman, Malayan Archipelago, Australia.

189. **Vitex Negundo** Linn.

Great Coco; east coast, very rare; Little Coco; in salt marshes, extremely common.

Afghanistan, Tropical Asia, Philippines.

190. **Vitex pubescens** Vahl.

Table Island; common on north coast.

India, Burma, Malaya.

191. **Vitex Wimberleyi** Kurz.

Little Coco, not common.

Andamans.

192. **Clerodendron inerme** Gaertn.

In all the islands, extremely common on the coasts.

India, Burma, Tenasserim, Andamans and Nicobars.

193. **Avicennia officinalis** Linn.

Common in one mangrove swamp near south end of Great Coco; elsewhere rare.

Indian, Malayan, and Polynesian sea-coasts.

LABIATÆ.

194. **Anisomeles ovata** R. Br.

Great Coco; abundant in beach-forest at north end of island. This does not occur in the small clearing, but is very abundant in the jungle near it. It may have been introduced by man but is more probably indigenous; it occupies much the same situations and is even more plentiful in Diamond Island. Not previously reported from the Andamans.

India, Burma, Malaya, China, Philippines.

INCOMPLETÆ.

NYCTAGINEÆ.

195. BOERHAAVIA REPENS Linn.

In all the islands, common on every rocky promontory and on all the isolated rocks on the reefs not covered by the tides.

Cosmopolitan in the tropics.

196. PISONIA ACULEATA Linn.

In all the islands, one of the commonest climbers in the beach-forests.

Cosmopolitan in the tropics.

197. PISONIA EXCELSA Blume.

In all the islands, common in the beach-forests.

Andamans, Malaya.

AMARANTACEÆ.

198. CELOSIA CRISTATA Linn.

Table Island, an escape in the light-house clearing.

Cosmopolitan in the tropics.

199. ACHYRANTHES ASPERA Linn. *var.* TYPICA.

Table Island and Great Coco, common in the clearings, introduced.

Cosmopolitan in the tropics.

var. PORPHYRISTACHYA Hook. f.

Little Coco, very abundant in the beach-forests; stems 10–15 feet long, climbing over the sea-face jungle. A plant in habit remarkably unlike the preceding.

South-Eastern Asia.

200. GOMPHRENA GLOBOSA, Linn.

Table Island, an escape, but very plentiful and extending into the jungle.

Cosmopolitan in the tropics; probably originally American.

POLYGONACEÆ.

201. POLYGONUM BARBATUM Linn.

Great Coco; this plant fringes the small lake at the north-east corner of the island, growing partly in and partly out of the water, just within it is a floating belt of *Panicum Myurus*, while outside is a ring of *Hygrophila quadrivalvis.* None occurs in the lake on Little Coco.

Africa; India, Ceylon; Burma, Malaya.

ARISTOLOCHIACEÆ.

202. BRAGANTIA TOMENTOSA Blume.

Little Coco; abundant on the interior ridges.

Tenasserim, Andamans; Java.

203. ARISTOLOCHIA TAGALA Cham. & Schlecht.
Both islands, frequent.
India, Burma, Malaya; Nicobars.

PIPERACEÆ.

204. PIPER CANINUM Blume.
Great Coco.
Tenasserim, South Andaman, Malaya.

MYRISTICEÆ.

205. MYRISTICA IRYA Gaertn.
Great Coco; frequent in interior towards eastern side.
Ceylon, Andamans, Tenasserim, Malaya.
206. MYRISTICA GLAUCA Blume.
Great Coco.
Burma, Andamans, Malaya.

LAURINEÆ.

207. DEHAASIA KURZII King.
Little Coco.
Tenasserim, Andamans.
208. HERNANDIA PELTATA Meissn.
In all the islands, on the eastern coasts.
East Africa, Madagascar; Laccadives, Ceylon; Andamans, Nicobars; Mergui, Malaya, Archipelago; North Australia; Polynesia.
209. CASSYTHA FILIFORMIS Linn.
Great Coco, occasional; Little Coco, extremely plentiful on all the coasts.
Cosmopolitan in the tropics.

LORANTHACEÆ.

210. LORANTHUS LONGIFLORUS Desrouss.
Great and Little Coco.
India, Ceylon; Burma, Malaya; Andamans.

SANTALACEÆ.

211. CHAMPEREIA GRIFFITHIANA Planch.
Both islands; common on the coasts.
Tenasserim, Malaya; Andamans, Nicobars.

EUPHORBIACEÆ.

212. EUPHORBIA ATOTO Forst.

In all the islands, very common on the sandy beaches.

India, Ceylon; Andamans, Nicobars; Malaya; Australia; China; Polynesia.

213. EUPHORBIA PILULIFERA Linn.

Table Island; in light-house clearing, still rare.

Cosmopolitan tropical and subtropical weed.

214. BRIDELIA KURZII Hook. f.

In all the islands, common on the western sea-face.

Nicobars.

215. BRIDELIA TOMENTOSA Blume.

Great Coco, common.

India; Burma; Andamans, Malaya; China; Philippines; North Australia.

216. PHYLLANTHUS COLUMNARIS, Muell.-Arg.

Table Island, common.

Pegu, Tenasserim.

217. FLUEGGIA MICROCARPA Blume.

Great Coco.

Africa; India, Ceylon; Assam, Burma, Malaya; Australia; China.

218. CYCLOSTEMON ASSAMICUS Hook. f.

In all the islands, a very common tree, gregarious where it occurs.

Sikkim, Assam.

219. APOROSA VILLOSULA Kurz.

Great Coco.

Pegu, Tenasserim, Andamans.

220. CROTON SUBLYRATUS Kurz.

In all the islands, common in the beach-forests.

Andamans and (perhaps) Tenasserim.

221. BLACHIA ANDAMANICA Hook. f.

Great Coco, coasts, very common; Little Coco, frequent in beach-forests.

Andamans.

222. CLAOXYLON LONGIFOLIUM Muell.-Arg.

Great Coco.

Malaya.

223. MALLOTUS ACUMINATUS Muell.-Arg. (=*M. Helferianus* Kurz.).

Great Coco, common.

Tenasserim; Andamans; Malaya.

224. MALLOTUS ANDAMANICUS Hook. f.

Great and Little Coco; common, and, where it occurs, gregarious.

Andamans.

225. MACARANGA TANARIUS Muell.-Arg.
Great Coco and Little Coco; common in the beach-forests.
Arracan (Diamond Island); Andamans; Malaya.

226. CNESMONE JAVANICA Blume.
Great Coco; plentiful on rocky promontories at north end of island.
Bengal, Assam, Burma, Malaya.

URTICACEÆ.

227. PHYLLOCHLAMYS SPINOSA Bureau.
Little Coco, common.
India, Ceylon; Burma, Malaya; Andamans.

228. PLECOSPERMUM ANDAMANICUM King.
Little Coco.
Tenasserim, Andamans.

229. FICUS BENJAMINA Linn.

Great Coco; not in fruit, therefore the particular variety cannot be determined.

India, Assam, Burma, Andamans, Malaya.

230. FICUS RUMPHII Vahl.

Little Coco, on the east coast; this species is here very rare. In Diamond Island, Arracan, this is one of the commonest trees on the coast.

India, Burma, Malaya, Andamans.

231. FICUS RETUSA Linn. *var.* NITIDA Thunbg. (sp). *F. comosa* Curtis, Bot. Mag., t. 3305 [1834].

In all the islands, very common. The fruits of this species, as Mr. Kendall, I. M., pointed out to me, is one of the favourite foods of a large pigeon, *Carphopaga bicolor*, which visits the group in enormous numbers during the cold weather.

India; Burma; Andamans, Malaya; China; Australia; New Caledonia.

232. FICUS BREVICUSPIS Miq.

In all the islands, common. The fruits are borne both on young branches in leaf axils, and on old wood in bunches.

Andamans, Malaya.

233. FICUS CALLOSA Willd.
Great Coco.
India, Burma, Malaya.

234. FICUS HISPIDA Linn. f.
Great Coco, common.
India, Ceylon; Burma, Malaya.
var. DÆMONUM Kœnig (sp.).

Little Coco.
Distribution of type.

235. FICUS GRISEA Wall. Cat. 4544.
Great Coco. Fruits of this a favourite food of the Green Parrots.
Burma. (Salween valley).

236. ANTIARIS TOXICARIA Leschen.
Great Coco.
India, Ceylon; Burma, Tenasserim, Malaya.

237. ARTOCARPUS GOMEZIANA Wall.
Great Coco and Little Coco, very common.
Tenasserim, Malaya, Andamans.

GYMNOSPERMÆ.

CYCADACEÆ.

238. CYCAS RUMPHII Miq.

In all the islands, very common in beach-forests, sometimes attains a height of 50 feet, and a girth of over 5 feet.

Tenasserim, Andamans, Nicobars; Malaya; North Australia, New Guinea.

MONOCOTYLEDONES.

ORCHIDACEÆ.

239. DENDROBIUM SECUNDUM Wall.

In all the islands, common. The only *very* common orchid on forest trees; specimen brought and flowered at Calcutta.

Martaban, Tenasserim; Penang, Sumatra, Java, Cochin China.

240. CALANTHE VERATRIFOLIA R. Br.

Great Coco, not uncommon on the interior ridges. The same species was also found, a few days later, on Rutland Island at the opposite end of the Andaman group.

India, Andamans, Malaya.

241. DORITES WIGHTII Benth. *var.*—— ?

Great Coco, frequent on trees in the low, flat swampy land near the coast; specimens were brought and flowered at Calcutta. The foliage as well as the shape and markings of the flowers quite agree with those of the typical plant, but in the Coco Island specimens the flowers are distinctly larger and the ground colour is violet instead of yellow.

242. AERIDES MULTIFLORUM Roxb.
Great Coco, occasional near the sea.
India, Burma, Andamans, Malaya.

243. PHOLIDOTA IMBRICATA Lindl.
Great Coco, occasional.
India, Burma, Malaya.

SCITAMINEÆ.

244. COSTUS SPECIOSUS Linn.
Great Coco, frequent.
India, Himalaya, Indo-China, China, Malaya.

245. ZINGIBER sp.

Great Coco, common. Near *Z. corollinum* Hance; probably a new species (*Baker in sched.*). In fruit only on the occasion of these visits; the rhizomes brought to Calcutta have not yet flowered.

246. MUSA SAPIENTUM Linn.

The *Plantain* is cultivated in the light-house garden; it has already disappeared, probably owing to the presence of cattle, from the site of the garden on Great Coco.

AMARYLLIDACEÆ.

247. CRINUM ASIATICUM Linn.
In all the islands, very common in the coast zone.
Andamans, Nicobars, Malaya.

TACCACEÆ.

248. TACCA PINNATIFIDA Forst.

In all the islands, common in the coast zone. Some of these were huge specimens and the tubers brought to Calcutta produced leaves and flowers in no way inferior to those in their native habitat. The following measurements are from an average specimen—the tallest grown had a peduncle 116 inches high.

Leaf-stalk 40 inches, lamina 3-fid, each lobe 36 in. long, the lateral lobes 2-fid from the 8th inch; the central lobe and each segment of the lateral lobes 36 in. across; peduncle 80 inches; leafy bracts 3 in. long, 2 in. across; filiform bracts 16 in. long, their basal sixth green, the remainder pale purple; perianth segments $\frac{3}{8}$ in. long, $\frac{1}{8}$ in. across, pale green with purplish edges.

India, Burma, Malaya, Andamans,

DIOSCOREACEÆ.

249. DIOSCOREA GLABRA Roxb.
In all the islands, common.
India, Burma, Malaya, Andamans.

250. Dioscorea pentaphylla Linn.
In all the islands, common.
India, Ceylon, Burma.

LILIACEÆ.

251. Smilax macrophylla Roxb.
In all the islands, common.
Eastern Himalaya, Assam, Arracan, Pegu.

252. Asparagus racemosus Roxb.
Great Coco; in low-lying lands behind the mangrove-swamps at north end of island.
India, Burma, Andamans, Java.

253. Dracæna angustifolia Roxb.
Both islands; small tree in coast zone.
India, Burma, Andamans, Malaya; N. Australia.

254. Dracæna spicata Roxb.
In all the islands, frequent on interior ridges.
India, Burma, Malaya, Andamans, Nicobars.

255. Gloriosa superba Linn.
Great Coco; east coast, frequent.
Tropical Asia and Africa.

COMMELYNEÆ.

256. Pollia zorzogonensis Endl.
Great Coco, rather common.
India, Burma, Andamans, Narcondam, Malaya.

257. Commelina obliqua Hassk.
Great Coco. Seeds smooth, but only two in number in both specimens collected.
India, Burma, Malaya; not before reported from the Andamans.

258. Aneilema ovatum Wall.
Great Coco, Little Coco; common.
Pegu, Tenasserim, Andamans.

FLAGELLARIEÆ.

259. Flagellaria indica Linn.
In all the islands, very common in beach-forests.
India, Indo-China, Andamans, Nicobars, Malaya; Australia; Mauritius.

PALMEÆ.

260. CARYOTA SOBOLIFERA Wall.

In all the islands, very common in beach-forests.

Indo-China, Andamans, Malaya.

261. CORYPHA ELATA Roxb., Flor. Ind. 2, 176; Griff., Ind. Palm. 112, t. 220 D.—*C. Gebanga* Kurz, Jour. As. Soc. Beng. 43, pt. 2, 206, nec Blume.—*C. macropoda* Kurz, l. c. 205, t. 15.

Great Coco, rare; Little Coco, very common.

This palm, which is very common in Little Coco and particularly so near the lake at the south-west corner of the island has leaf stalks up to 25 feet long and leaves up to 20 feet across and is clearly identical with Kurz's *C. macropoda.* But Kurz's plant does not appear to be specifically distinct from *C. elata.* Kurz has himself in his subsequent writings noted that his first impression that this is a stemless palm was erroneous, admitting that it has a stem at least 8—12 feet high. Moreover in Little Coco at least one example had reached a height of 60 feet and was not yet in flower in 1890, while in 1889 and 1890 Dr. King and myself obtained both flowering and fruiting specimens of Kurz's Andamanese *Corypha* near Port Blair; these prove the species to be *Corypha elata.* Kurz is, I believe, in error in identifying Roxburgh's *C. elata* with Blume's *C. Gebanga,* the two trees—as grown in Hort. Calcutta—are very different in appearance; the leaves of *C. Gebanga* are much paler in colour and Blume's figure of the inflorescence of *C. Gebanga* (Rumphia 2, tt. 97, 98 and 105) shows an open panicle that will not at all suit *C. elata,* which has a very dense inflorescence like a gigantic head of parsley. In any case Roxburgh's name (1832) has four years' priority and Kurz's reduction is, therefore, on that ground alone, untenable. The writer is of opinion, and Dr. King agrees, that the examples of *C. elata* in Hort. Calcutta may have been originally introduced from the Andamans and that the species is only there indigenous. At all events it has not hitherto been found wild in any part of India or Burma.

262. LIVISTONA sp.

Great Coco; occasional on inland ridges. This palm, the 3 or 4 examples of which met with were stemless or had stems under two feet high, seems to be nearly related to *L. Jenkinsiana* Griff., Palm. Brit. Ind. 128, t. 226 A. B. and to *L. speciosa* Kurz, Jour. As. Soc. Beng., 43, 2, 204, t. 13, 14, the differences between which species Mr. Kurz himself admits are not great. The Coco species may not of course be a dwarf one, but if it is not it seems remarkable that no tall examples were met with. The leaves are remarkably like those of *L. speciosa* and Mr.

Kurz's description would suit them very well except that the transverse veins are, in the Great Coco plant, even more prominent than in *L. speciosa*; the *ligula* however is very different.

Mr. Kurz does not describe the *ligula* in *L. speciosa*; it is, however, shewn (perfectly accurately) in t. 13, f. 5. as cordate and entire—just as it is in *L. Jenkinsiana.* In the species under review the *ligula* is larger, ovate orbicular, and armed at the margin with small but hard, flat black blunt spines, a character exhibited by no flabellate-leaved palm of which specimens are preserved in Calcutta Herbarium.

263. CALAMUS ANDAMANICUS Kurz.

In all the islands, common.

Andamans.

264. CALAMUS TIGRINUS Kurz.

In all the islands, common.

Andamans, Tenasserim.

265. COCOS NUCIFERA Linn.

In all the islands, extremely abundant. Probably not truly indigenous, though perhaps not intentionally introduced. It has long been known that this palm occurred on these islands; the name "Cocos Islands," applied to the group, is of older date than 1652, and it has often been the subject of remark that while this is so and while every island in the Nicobars, even uninhabited ones like Batti Malv, has Coco-nut trees, the species is altogether absent from the intervening Andaman islands. Kurz, in *Forest Flora Brit. Burma*, says the Coconut occurs on north-east Andaman also, but the writer is unable to ascertain on what authority, and the statement is contradicted by the officers of the settlement at Port Blair who alone know the coasts of the group intimately. There are here and there individual trees on the Andaman coasts now; Dr. Alcock tells me there is one on South Sentinel; the writer saw one on Rutland Island; Captain Simpson, Assistant Port Officer, Madras, tells me he recollects being in a small bay in one of the islands of the Eastern Andaman Archipelago where there are some trees. But all these are quite recent introductions and are mainly due to the humanitarian efforts of the officers of the Andamans who plant them when they visit various places along the coasts; the instance quoted by Captain Simpson is, however, attributed to a wreck. No explanation based on the set of currents in these seas is sufficient to explain the peculiar distribution of the Palm, and the writer is inclined to believe that the presence of the species in the Coco Islands is due to the wreck of some Coco-laden craft on their coasts.

Once established the species spreads with great rapidity. On Barren Island *one* tree was known in 1881; in 1891 thirteen were counted, of which seven were bearing. In Narcondam there were in 1891 Coco-nut trees, many of them bearing, in 3 separate bays on the N. W., N., and N. E. aspects of the island respectively. These *may* have been brought from the Coco group by a strong North-East to South-West current that sets down on this island from the neighbourhood of that group, but I am inclined to think they owe their presence to an act of unrecorded piety on the part of some humane individual who has visited the island, for in the North Bay where the trees are most numerous there is, just behind the coco-nut zone, a large patch of Plantains which clearly must have been introduced intentionally.

It should not be forgotten that at some remote period a colony may have been started in the Coco group and then abandoned. It is known that in recent times two such attempts have been made and that both have failed owing to the unhealthiness of the place. It may be that the Coco-nut was intentionally introduced on some similar occasion of which no record has been left. In any case, to speak of the coco-nut as "wild" here, as Mr. Kurz does (*Jour. As. Soc. Beng.*, xliii, Pt. 2, p. 200) is apt to convey the erroneous impression that the species is here truly indigenous.

The coco-nut cannot be said to be known in a truly wild state, though it occurs on many uninhabited islands, and its original home is by no means certain.

The quality of these coco-nuts is little inferior to that of those cultivated at Port Blair and though distinctly inferior to those cultivated in the Nicobars they are much the same as those on Batti Malv where there are no inhabitants.

America, Polynesia, Malaya, India.

PANDANEÆ.

266. PANDANUS ODORATISSIMUS Linn. f.

In all the islands, common on the coasts.

India, Indo-China, Malaya, Andamans, Nicobars.

AROIDEÆ.

267. AMORPHOPHALLUS sp. (aff. *A. bulbifer*).

Great Coco, common; Little Coco, occasional. Only leaves and very advanced fruit obtained; tubers brought to Calcutta have as yet only produced leaves, but these leaves are bulbiferous and indicate this as a species nearly related to, but apparently distinct from, both *A. bulbifer* and *A. tuberculiger*.

268. ALOCASIA FORNICATA Schott.

Great Coco, common.

India, Indo-China, Malaya, Andamans.

269. SCINDAPSUS OFFICINALIS Schott.
In all the islands, common.
India, Indo-China, Malaya, Andamans.

270. POTHOS SCANDENS Linn.
In all the Islands, common.
India, Indo-China, Malaya, Andamans.

NAIADACEÆ.

271. CYMODOCEA CILIATA Ehrb. ?

On the reefs of all the islands ; extremely common and forming vast submarine meadows. This species is exceedingly common in the Andamans and has been met with in equal abundance at Rangachang near Port Blair (there associated with another species of apparently the same genus), at Rutland Island, at Little Andaman (there in company with *Halophila ovalis*), and at Car Nicobar. No flowering or fruiting specimens have yet been reported at Calcutta. This is the plant supposed by Kurz (*Jour. As. Soc. Beng.*, xlv, Pt. 2, p. 154) to be a small form of *Enhalus aceroides.*

272. ZANICHELLIA PALUSTRIS Linn.
Little Coco, in the small lake along with *Chara fœtida.*
Cosmopolitan in salt-marshes.

CYPERACEÆ.

273. CYPERUS POLYSTACHYUS Rottb.
Great Coco ; west coast, rather common on the bare grassy slopes.
Cosmopolitan.

274. CYPERUS ELEGANS Linn.
Great Coco ; frequent in wet patches in the dense interior jungle.
India, Indo-China, Malaya, Andamans ; America.

275. CYPERUS DILUTUS Vahl.
Great Coco ; occasional.
India, Indo-China, Malaya, Andamans.

276. CYPERUS PENNATUS Lamk.
In all the islands, very common on the coast in rocky places.
Sea-shores of the Indian Ocean.

277. KYLLINGA BREVIFOLIA Roxb.

Great Coco, clearing at north-east corner ; Table Island, clearing near light-house ; common.

India, Indo-China, Malaya, Andamans.

278. FIMBRISTYLIS DIPHYLLA Vahl.

Table Island and Great Coco, in the clearings ; also on the rocky coasts.

India, Burma, Malaya, Andamans ; Australia, Africa, America.

279. FIMBRISTYLIS FERRUGINEA Vahl.
Great Coco and Little Coco, on coral-shingle.
India, Burma, Malaya.

280. FIMBRISTYLIS QUINQUEANGULARIS Kunth.
Great Coco and Table Island, in marshy ground.
India, Indo-China, Malaya.

281. FIMBRISTYLIS MILIACEA Vahl.
Great Coco, flat marshy ground near the small lake.
India, Indo-China, Malaya.

282. SCIRPUS SUBULATUS Vahl.
Little Coco, in the lake at the south-west corner of the island, abundant.
Bengal (Salt lakes); Beluchistan, Panjab; Africa, (Egypt).

GRAMINEÆ.

283. PASPALUM SCROBICULATUM Retz.
Little Coco, abundant in the lake.
India, Indo-China, Malaya.

284. PANICUM CILIARE Retz.
Great Coco, near south end of island.
India, Indo-China.

285. PANICUM COLONUM Linn.
Table Island, light-house clearing; Great Coco in the clearing, also at south end of island in Coco-nut zone.
Cosmopolitan in the tropics.

286. PANICUM HELOPUS Trin.
Table Island, in the clearing.
India, Indo-China.

287. PANICUM JAVANICUM Poir.
Great Coco, common.
India, Indo-China, Malaya.

288. PANICUM MYURUS Lamk.
Great Coco; in matted manses floating in the small lake at north-east corner of island.
India, Indo-China, Malaya.

289. PANICUM MONTANUM Roxb.
Great Coco, with the next species, in deep jungle.
India, Indo-China, Malaya, Andamans.

290. OPLISMENUS COMPOSITUS Roem. & Schult.
Great Coco, in dense jungle, occasional.
Cosmopolitan or nearly so.

291. Thuarea sarmentosa Pers.

Great Coco, common as a turf under Coco-nut trees.

Shores of Indian Ocean.

292. Ischæmum ciliare Retz.

Great Coco, common on grassy slopes and under Coco-nut trees.

India, Indo-China, Malaya.

293. Ischæmum muticum Linn.

Great Coco, occasional only; Little Coco, extremely abundant.

India, Indo-China, Malaya.

294. Andropogon contortus Linn.

Table Island and Great Coco; the common grass both in the clearings and on the naturally bare headlands of the western coast.

Cosmopolitan in the tropics.

295. Eleusine indica Gaertn.

Table Island, frequent; Great Coco, rare.

Cosmopolitan in the tropics.

296. Eleusine ægyptiaca Roxb.

Table Island; in the light-house clearing, scarce.

Cosmopolitan, or nearly so, in the tropics.

297. Dendrocalamus strictus Nees, *var.*— ?

Great Coco, on one hill, abundant; Table Island, plentiful. Flowering examples were obtained on Table Island which have been kindly examined by Mr. J. S. Gamble. There seems no doubt as to the species, the specimens do not however quite agree with typical examples. There is little doubt that this Bamboo is here indigenous and, from an account received from Mr. Godwin-Austen (formerly of Port Blair), appears to occur on Saddle Peak in North Andaman also. It does not occur in South Andaman.

India, Burmah.

CRYPTOGAMÆ.

Vasculares.

FILICES.

298. Davallia solida Sw.

Great Coco, east coast, very common on *Mimusops littoralis* and other tall trees.

Andamans, Malaya, Polynesia, Australia.

299. Adiantum lunulatum Burm.

Great Coco, on interior ridges frequent; Table Island, common.

Cosmopolitan in the tropics.

300. CERATOPTERIS THALICTROIDES Brogn.

Great Coco, in wet places in the interior with *Cyperus elegans.*

Cosmopolitan in the tropics.

When discussing the weeds of the Andaman Flora (*Jour. As. Soc. Beng.*) the writer imagined this fern to have been introduced into these islands by human agency, at least indirectly. But the Coco locality proves sufficiently to his mind that its presence is altogether independent of man's presence, and he has since then collected it in similar situations in South Andaman. It is probably not at all common however, and hence it had escaped the notice of Mr. Kurz when he collected in the Andamans.

301. POLYPODIUM IRIOIDES Lamk.

In all the islands, frequent.

India, Indo-China, Andamans, Malaya; Australia, Polynesia; Africa

302. POLYPODIUM ADNASCENS Sw.

Great Coco, on trees in mangrove swamps; Little Coco, on trees in lagoon at south-west end of island.

India, Indo-China; Andamans, Nicobars; Malaya; Polynesia; Africa.

303. POLYPODIUM QUERCIFOLIUM Linn.

In all the islands, very plentiful in the same situations as *Davallia solida.*

India, Indo-China; Andamans, Nicobars; Malaya; North Australia.

304. VITTARIA ELONGATA Sw.

Great Coco, not very common.

India, Indo-China; Andamans, Malaya; Australia, Polynesia; Africa.

305. ACROSTICHUM SCANDENS J. Sm.

Great Coco, very common in the low-lying lands behind the coast zone.

India, Indo-China; Andamans, Malaya; Australia, Polynesia.

306. ACROSTICHUM APPENDICULATUM Willd., *var.* SETOSA.

Great Coco, the only common ground fern on the interior ridges.

India, Indo-China; Andamans, Malaya.

307. LYGODIUM FLEXUOSUM Sw.; Bedd.

In all the islands, common in the dense dwarfed jungle on the ridges.

India, Burma; Andamans, Malaya; Australia; Africa.

CHARACEÆ.

308. CHARA FŒTIDA A. Braun.

Little Coco; abundant in the lagoon.

India, Indo-China.

MUSCI.

309. Calymperes Dozyanum Mitt.

Great Coco, on damp rocks in a sheltered bay on west coast, also on *Mimusops* trunks in coast zone; Little Coco, on trunks of *Mimusops littoralis.*

Samoa; Java, Philippines; Ceylon; Admiralty Islands.

310. Bryum coronatum Schwaegr.

Great Coco, on charred stumps of *Mimusops littoralis* at south end of island.

Tropics of both hemispheres.

HEPATICÆ.

311. Lejeunia sp.

In all the islands, on trees, common.

312. *Hepatica* sp. (genus indeterminable).

Great Coco, on trees in mangrove swamps.

Cellulares.

LICHENES.

313. Collema nigrescens Achar.

Little Coco, soft pulpy masses on stems of *Cycas Rumphii*

Cosmopolitan.

314. Physcia sp. (near *Ph. obscura* Fr.)

Little Coco, on stems of *Cycas Rumphii*.

315. Physcia sp.

Great Coco, on rocks, west coast.

316. Leprabia sp. (specimens imperfect).

Great Coco.

FUNGI.

317. Lentinus leucochrous Fries.

Great Coco, on dead wood, common.

* Asia.

318. Lenzites deplanata Fries.

Great Coco, on dead wood, common.

* Asia.

319. Lenzites subferruginea Berk.

Great Coco

* Asia.

320. POLYPORUS FULVUS Fries.
Great Coco.
* Asia.

321. POLYPORUS XANTHOPUS Fries.
Great Coco, on dead stems.
Cosmopolitan in the tropics.

322. POLYPORUS SANGUINEUS Fries.
Great Coco; on dead stems of *Cocos nucifera*.
Cosmopolitan in the tropics.

323. POLYPORUS GRAMMATOCEPHALUS Berk.
Great Coco, on dead wood.
India, Indo-China, Malaya, Australia, America.

324. POLYPORUS AUSTRALIS Fries.
Great Coco.
Cosmopolitan in the tropics.

325. HEXAGONA PERGAMENEA Berk. & Broome.
Great Coco,
Ceylon (*Berkeley and Broome, Jour. Linn. Soc.* xiv, 57).

326. HEXAGONA SERICEO-HIRSUTUS Kl.
Great Coco; on dead wood.
North America (*Klotzsch, Linnæa* viii, 483).

327. HEXAGONA TENUIS Hook.
Great Coco, on dead wood.
Nicobars (*Fenzl, Novara Bot.* ii, 138); Mauritius (*Klotzsch, Linnæa* viii, 482).

328. DEDÆLEA FLABELLUM Berk.
Great Coco, on dead wood.
* Asia.

329. DEDÆLEA SANGUINEA Kl.
Great Coco, on dead wood.
India (*Klotsch, Linnæa* viii, 481).

330. DEDÆLEA QUERCINA Fries.
Great Coco, on dead wood.
Cosmopolitan.

331. DEDÆLEA CONCENTRICA Fries.
Great Coco, on dead wood.
Cosmopolitan in the tropics.

332. THELEPHORA INCRUSTANS Pers.
Great Coco, on *Pongamia glabra;* Little Coco, on *Cycas Rumphii.*
Cosmopolitan.

333. BOVISTA LILACINA Berk.
Great Coco, on grassy slopes.
Cosmopolitan in the tropics.

334. HIRNEOLA POLYTRICHA Mont.

Great Coco, on dead wood.

Tropics of both hemispheres and Polynesia.

335. XYLARIA CLAVARIOIDES G. Massée, sp. nov.

Xylaria (*Xylocoryne*) stromatibus sæpius solitariis rarius in cæspitibus 2—5 connatis cylindraceis, 2—4 cm. altis, $\frac{1}{3}$—$\frac{1}{2}$ diam.; extus atris papilloso-scabris, intus candidis stipite elongato, coriaceo-suberoso nigro-velutino demum nudo; peritheciis clavulæ omnino immersis; ascis cylindricis, pedicellatis, octosporis; sporidiis oblique monostichis, ellipticis, nigricantibus 10—11 × μ. (Prain n. 45). In lignis putridis.

Great Coco, common on dead stems of *Mimusops littoralis.*

336. DALDINIA VERNICOSA Cos. & de Not.

Great Coco, on dead wood.

India, America.

337. RHYTISMA sp.

In all the islands, on leaves of *Ficus brevicuspis.*

Andamans, (the same species apparently is equally common at Port Blair).

338. ———.

Besides the above there occurs on both islands a *Fungus* which appears to be very widely dispersed throughout the Andamans and Nicobars, but has so far been only found as a white mycelium that appears as a narrow band on the bark of slender branches, runs upwards along these and divides into still narrower bands on the branchlets; these branch and anastomose and send still narrower bands (threads) upwards along the petioles of the leaves and finally spread as a thin network on the *under* surface of the lamina. The writer has found the same blight (known to the officers at Port Blair as "thread-blight") on the following species: *Alsodeia bengalensis, Ochna squarrosa, Bombax insigne, Camellia theifera, Hibiscus rosa-sinensis, Gardenia* sp., *Pongamia glabra, Diplospora singularis, Blachia andamanica, Ficus nitida;* it is also reported to occur on a species of *Phalænopsis.* Its effect is in every case the same, the leaves affected become yellow and sickly, and as regards *Ochna* among indigenous species and the Tea-plant among cultivated species, when affected they become brown and die. The blight spreads with great rapidity and for a time threatened the existence of the Tea-industry at Port Blair. Drs. Cunningham and Barclay have both examined specimens but as there is no sign of any advance beyond the mycelial stage the position of the *Fungus* is at present indeterminable.

339. ———.

A second fungus of some interest is an *Uredine* that was found in considerable quantity on *Clerodendron inerme.* This the writer has met with, always producing the same characteristic effects on this *Clerodendron*, in South Andaman, Little Andaman, and Car Nicobar, as well as on Great Coco. The specimens were examined by the late Dr. Barclay, but were found insufficient for determination.

340. ———.

A third fungus of note causes a "dry-rot" in the fallen trunks of *Mimusops littoralis* on the beach. The effect produced simulates in a wonderful manner charring by fire; it appears to be confined, so far as the drift timber and wreckage on these islands is concerned, to *Mimusops* and *Quercus*—the planks of a wooden vessel, apparently of oak, that had been wrecked on Little Coco, being attacked like the Bullet-wood trees; Teak, Sundri and other logs were not affected.

ALGÆ.

341. SARGASSUM ILICIFOLIUM J. Agardh.

In all the islands; in great beds at the outer margins of the fringing reefs and in the deeper water beyond; the only really common sea-weed.

Almost Cosmopolitan in the tropics; not from Australia (*Hemsl.*, *Report on Bot. of Admiralty Islands*, p. 271).

342. TURBINARIA ORNATA J. Agardh.

In all the islands; rather common both on coral and on sandstone reefs.

* Indian Ocean.

343. PADINA PAVONIA Gaill.

In all the islands; on both coral and sandstone.

Cosmopolitan in tropical seas.

344. DICTYOTA DICHOTOMA Lamour.

Great Coco; on coral reefs.

Common in both north and south temperate seas, rarer in the tropics.

345. LITHOTHAMNION POLYMORPHUM Aresch.

Great Coco; on coral reefs.

Atlantic, Mediterranean, South Africa; Chonos Archipelago.

346. ACANTHOPHORA THIERII Lamour.

Little Coco; pools on coral reefs.

Cosmopolitan in tropical seas.

347. JANIA TENELLA Kuetz.

Great Coco; on reefs, on *Lithothamnion polymorphum*.

* Indian Ocean.

348. GRACILARIA CRASSA Harv.
In both islands; in pools on coral sand.
* Indian Ocean.

349. GELIDIUM CORNEUM J. Agardh.
Great Coco; on coral reefs; also growing on *Halimeda Opuntia.*
Almost Cosmopolitan.

[A specimen of a *Gelidium* washed up by the tide on Little Coco, was too much withered and bleached to be identified; another was collected there on the reefs, but in too early a stage of development to be named.]

350. CAULERPA CLAVIFERA J. Agardh.
Both islands; on reefs.
Cosmopolitan in tropical seas.

351. CAULERPA PLUMARIS J. Agardh.
Little Coco; in pools on coral reefs.
* Indian Ocean.

352. VALONIA FASTIGIATA Harv.
Great Coco; on coral reefs.
Indian Ocean and Pacific.

353. VALONIA CONFERVOIDES Harv.
Great Coco; in pools on coral sand.
* Indian Ocean.

[A species of *Valonia* was collected on Little Coco also, but in too early a stage of development to be named].

354. HALIMEDA OPUNTIA Lamour.

In both islands; both on sandstone and on coral reefs, rather common.

Cosmopolitan in tropical seas.

355. SIPHONOCLADUS? FILIFORMIS De Toni.

Washed ashore on the coast of Little Coco after stormy weather that prevailed for three days during our visit.

356. VAUCHERIA sp.

Little Coco; on sandstone reefs. None of the specimens obtained were in fruit.

Andamans and Nicobars, the same species apparently was found by the writer to be plentiful in South Andaman and in Car Nicobar.

357. CALOTHRIX PULVINATA J. Agardh.
Little Coco; in pools above high water mark.
Cosmopolitan.

358. ———.

A *Nostocaceous Alga* in habit, very like the preceding, was obtained in the shallower *tidal* pools on Great Coco, but the specimens were too much withered to be determinable.

[Where an asterisk precedes the distribution of any *Fungus* or *Alga* it has been impossible to ascertain whether the species in question extends beyond the area indicated].

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§ § § NATURE, DISTRIBUTION, AND PROBABLE ORIGIN OF THE FLORA.

In this list 358 distinct species are recorded, distributed among 268 genera and 95 natural orders; 297 species are *Phanerogams* and 61 are *Cryptogams*, giving a proportion of nearly five flowering plants to one flowerless species, the exact proportions and percentages being :—

Phanerogams : Cryptogams : : 4·85 : 1.

Phanerogams = 83 °/$_{\circ}$; Cryptogams = 17 °/$_{\circ}$.

In the two groups *Filices* and *Algæ* the list represents the *Cryptogamic* flora with probably the same degree of adequacy that it does the *Phanerogamic*. In the other *Cryptogamic* groups it is to be feared the representation is not so complete. Still the scarcity of *Mosses* and *Lichens* is a very striking feature of the flora, so is the paucity of *Ferns*; with all three groups it is not merely a case of few species being present, there are, except perhaps in the case of *Acrostichum scandens*, which is common, remarkably few individuals of these species.

Among the 297 *Phanerogams*, 238 are *Dicots*; only one of these (*Cycas Rumphii*) is a *Gymnosperm*, the other 59 being *Monocots*. The *Dicots* are distributed amongst 59 natural orders and 178 genera, the *Monocots* amongst 14 natural orders and 45 genera. The proportions and percentages here are :—

Dicots : Monocots : : 4 : 1.

Dicotyledons = 80 °/$_{\circ}$; Monocotyledons = 20 °/$_{\circ}$.

Altogether 66 per cent. of the flora consists of *Dicotyledons*, whilst among these the *Polypetalæ* exceed in number the rest of the groups combined, a somewhat unusual circumstance, since, as regards species at least, the Indian *Gamopetalæ* usually exceed the *Polypetalæ*; *Polypetalæ* here constitute, as it happens, one-third, or 33 °/$_{\circ}$ of the whole flora.

There are only 15 *Vascular Cryptogams* in the list as against 46 *Cellular Cryptogams*; these are together distributed amongst 45 genera and 22 natural orders; The proportions and percentages are :—

Vascular : Cellular : : 1 : 3.

Vascular Cryptogams = 25 °/$_{\circ}$; Cellular Cryptogams = 75 °/$_{\circ}$.

The subjoined table gives a synoptic view of the systematic disposition of the Coco Island Flora.

TABLE I. *Systematic synopsis of Coco Island orders, genera and species.*

PHANEROGAMÆ	73	223	297
Dicotyledones	59	178	238
Angiospermæ	58	177	237
Polypetalæ	30	86	119
Thalamifloræ	10	19	31
Discifloræ	10	29	33
Calycifloræ	10	38	55
Gamopetalæ	17	59	75
Incompletæ	11	32	43
Gymnospermæ	1	1	1
Monocotyledones	14	45	59
CRYPTOGAMÆ	22	45	61
Vasculares	8	12	15
Filices	4	7	10
Characeæ	1	1	1
Musci	1	2	2
Hepaticæ	2	2	2
Cellulares	14	33	46
Lichenes	2	3	4
Fungi	7	14	24
Algæ	5	16	18
TOTAL	NAT. ORDERS 95	*Genera* 268	Species 358

Of the 73 natural orders of *Phanerogams* 24 are represented by single species and 14 more by two species each. The most extensively represented natural order is *Leguminosæ*, with 34 species; followed after a long interval by *Euphorbiaceæ* and *Gramineæ*, each 15 sp.; *Convolvulaceæ*, 14 sp.; *Rubiaceæ*, 13 sp.,; *Urticaceæ*, 11 sp.; *Cyperaceæ*, 10 sp. *Filices*, amongst *Cryptogams*, are also represented by 10 species. None of the other orders have more than 8 species.

As to genera: 29 of these natural orders of Phanergams are represented by one genus; 13 by 2 genera: 11 by 3 genera; 6 by 4 genera; 5 by 5 genera; 4 by 6 genera; one natural order each where there are 7 genera (*Apocyneæ*); 8 genera (*Gramineæ*); 11 genera (*Rubiaceæ*); 12 genera (*Euphorbiaceæ*); and 22 genera (*Leguminosæ*): *Leguminosæ* thus leads both as regards genera and species. The subjoined table exhibits the relationship of the orders according to the wealth of their representation.

TABLE II. *Natural orders of Coco Island Phanerogams arranged according to their richness in species.*

Number of species.	Number of orders.	NAMES OF ORDERS.
34	1	*Leguminosæ.*
15	2	*Euphorbiaceæ, Gramineæ.*

Number of species.	Number of orders.	NAMES OF ORDERS.
14	1	*Convolvulaceæ.*
13	1	*Rubiaceæ.*
11	1	*Urticaceæ.*
10	1	*Cyperaceæ.* [*Filices* are also represented by 10 species.]
8	3	*Malvaceæ, Sterculiaceæ, Verbenaceæ.*
7	3	*Compositæ, Apocyneæ, Acanthaceæ.*
6	2	*Anacardiaceæ, Palmeæ.*
5	6	*Ampelideæ, Sapindaceæ, Rhizophoreæ, Combretaceæ, Orchidaceæ, Liliaceæ.*
4	4	*Tiliaceæ, Meliaceæ, Asclepiadaceæ, Aroideæ.*
3	10	*Olacineæ, Celastrineæ, Rhamneæ, Lythraceæ, Solanaceæ, Nyctagineæ, Amarantaceæ, Laurineæ, Scitamineæ, Commelynaceæ.*
2	14	*Menispermaceæ, Capparideæ, Guttiferæ, Dipterocarpeæ, Burseraceæ, Myrtaceæ, Passifloraceæ, Myrsineæ, Boragineæ, Bignoniaceæ, Aristolochiaceæ, Myristiceæ, Dioscoreaceæ, Naiadeæ.*
1	24	*Anonaceæ, Nymphæaceæ, Violaceæ, Rutaceæ, Moringeæ, Connaraceæ, Melastomaceæ, Cucurbitaceæ, Ficoideæ, Goodenovieæ, Sapotaceæ, Ebenaceæ, Gentianaceæ, Scrophularineæ, Labiatæ, Polygonaceæ, Piperaceæ, Loranthaceæ, Santalaceæ, Cycadaceæ, Amaryllidaceæ, Taccaceæ, Flagellarieæ, Pandanaceæ.*

If the species are classified according to their habit we find that 78 are climbers, 74 are trees that may exceed 30 feet in height, 20 are small trees that do not exceed 30 feet, 48 are shrubs and 138 are herbaceous, (treating as herbaceous species like *Carica*, *Scævola*, *Musa*, *Crinum*, etc., and all *Cryptogams* except the two climbing ferns, *Lygodium* and *Acrostichum scandens*, which are here included among the other climbers). But though as regards number of species herbaceous forms are so largely represented they are as a matter of fact extremely inconspicuous, two-fifths of them being cryptogams and one-third of these being marine. Nor, if we except the herbaceous climbers, which are here dealt with along with the woody ones, and the species that occur on the few bare grassy slopes, are herbaceous phanerogams more numerous than herbaceous cryptogams. The most numerously represented herbs are *Andropogon contortus*, *Desmodium polycarpon*, *Desmodium triquetum*, *Vernonia cinerea*, *Blumea virens*, the various species of *Fimbristylis*, *Cyperus pennatus* and *polystachyus*, *Boerhaavia repens*, *Ischæmum muticum*, *Thuarea sarmentosa*. Herbaceous species that frequent deep jungle only, such as *Desmodium laxiflorum*, *Urena lobata*, *Cyperus elegans*, *Oplismenus compositus*, *Panicum montanum*, *Alocasia fornicata*, *Costus speciosus*, *Zingiber* sp., *Amorphophallus* sp., *Acrostichum appendiculatum*, *Ceratopteris thalictroides*, etc., are not only very rarely met with, but are represented by extremely few individuals where they do occur.

Woody shrubs and small trees taken together do not, as regards species, quite equal in number the large trees. In point of number of individuals, however, this is not the case, for it is not unusual to find these, woody shrubs and the smaller trees truly gregarious, particularly on the ridges; the chief examples are *Glycosmis pentaphylla*, *Alsodeia bengalensis*, *Glyptopetalum calocarpum*, *Cyclostemon assamicus*, *Macaranga Tanarius*, *Miliusa* sp., *Cynometra ramiflora*, *Leea sambucina*, *Dendrocalamus strictus;* a far larger area is covered by small trees and woody undershrubs heavily loaded with creepers than is covered by tall forest. In the mangrove-swamps most species may be spoken of as gregarious, but even here there is no great number of trees over 40 feet high; and the only gregarious *tall* trees are *Mimusops littoralis* and *Gyrocarpus Jacquinii*, both denizens of the beach-forest behind the Coco-nut zone, and *Cocos nucifera* itself. Among the arboreous species in these islands have to be included *Cycas Rumphii*, which is very commonly 30—35 feet high and of which one specimen measured in Great Coco had a clear stem from ground to crown of 42 feet; also *Tournefortia argentea* which in Little Coco (and elsewhere in the Andaman group) is a tree 25—40 feet high with very black bark and a trunk often 3—3½ feet in girth; *Pongamia glabra* too, recorded by Mr. Baker in the *F. B. I.* as sometimes a climber, is here, as it also is in Bengal, always a tree from 20—60 feet in height. *Salacia prinoides* on the other hand is here always a heavy extensive climber.

Erect woody species therefore, including both trees and shrubs in this category, form almost exactly two-sevenths of the flora as regards number of species. As regards individuals, however, it will be no overestimation to say that these constitute six-sevenths of the vegetation, not merely in bulk but in actual number of individuals.

Climbing species, as compared with those having an erect or prostrate habit, show a much higher proportion of woody to herbaceous species. This is owing to the fact that of the 78 climbers only two are cryptogams, while in the other group 59 cryptogams are included. To give therefore an accurate conception of the conditions that prevail, the Cellular cryptogams ought to be excluded. Of the 312 Phanerogams and Vascular cryptogams 234 are of erect habit and 78 are climbing, giving a proportion of :—

Erect sp. : climbing sp. : : 4 : 1.

Among these erect vascular plants the proportion of woody to herbaceous is therefore :—

Woody sp.: Herbaceous sp. : : 3 : 2.

Of the climbers 35 are woody and 43 are herbaceous so that here the proportion is :—

Woody sp.: Herbaceous sp. : : 2 : $2\frac{1}{2}$.

Instead therefore of being lower amongst climbers than erect species, the proportion of herbaceous species to woody ones, when attention is confined to vascular plants only, is actually higher. And in number of individuals too there is a much more even balance among climbing species, since herbaceous climbing species, as well as woody ones, can easily raise themselves to the light and air for want of which no great quantity of herbaceous undergrowth can exist; indeed the herbaceous climbing species possess many advantages over their woody rivals, for they are not as a rule so heavy and as, moreover, they sometimes (*e. g.*, *Modecca*, *Trichosanthes*, *Dioscorea*, *Gloriosa)* die down annually, they do not destroy the species on which they are supported so soon as do heavy perennial creepers like *Calamus*, *Thunbergia*, *Anodendron*, *Chonemorpha*, *Derris*, etc., which in a few season drag down the trees on which they climb.

Some of the woody climbers, such as *Anodendron* and *Thunbergia*, climb to great heights, and are not surpassed in this respect even by the *Modecca*. The majority of the woody climbers, however, like *Sarcostigma*, *Salacia*, *Pisonia aculeata*, *Plecospermum*, the species of *Acacia* and of *Capparis*, are not to be found on tall trees at all, but load heavily the woody undergrowth of small trees and shrubs that forms the bulk of the forest. Nor is it unusual to find the forest, where composed of tall trees, exhibiting both classes of creepers; the characteristic lofty creepers on the tall trees overhead, the heavy woody creepers on the shrubby undergrowth below.

Of the climbing species 20, or 25°/$_0$, are armed. As a rule the armed species may be said to belong to the class of undergrowth climbers; with the exception of the two species of *Calamus*, the lofty climbers are unarmed.

The habit of the Coco Island species is shewn in the subjoined table.

TABLE III. *Habit of Coco Island species.*

Vascular species (Phanerogams and Vascular Cryptogams)					312
Species with erect habit				234	
Woody species			142		
Trees		94			
Exceeding 30 feet	74				
Under 30 feet	20				
Shrubs		48			
Herbaceous species (Herbs and Herbaceous shrubs)			92		
Climbing species				78	
Woody climbers			35		
Armed		13			
Unarmed		22			
Herbaceous climbers			43		
Armed		7			
Unarmed		36			
Non-vascular species (Lower Cryptogams)					46
Total Coco Island species					358

As regards habitat it will be gathered from what has been said above that a very large proportion of the flora is of arborescent forest-type. Next in point of numbers to the inland forest species, though only half as numerous, are the litoral species; following these at about an equal interval are parasitic or saprophytic species—a class here almost entirely composed of *Fungi;* after these in succession epiphytes; marine species, (mainly *Algæ*); weeds of cultivation; cultivated species; marsh or water plants; and species of open grassy slopes.

The subjoined table gives the numbers of each class of species; the meadow species, here separated from the forest species, are, owing to the smallness of their numbers, in all subsequent tables included with the forest species.

TABLE IV. *Habitat of Coco Island species.*

Civilized species				33
Cultivated plants			15	
Weeds of cultivation			18	
Wild species				325
Parasites and Saprophytes (Phanerog. 1)			31	
Epiphytes			19	
Marine plants (Phanerog. 1)			19	
Littoral species			80	
Inland species			176	
Forest species		162		
Jungle	150			
Grassy species	12			
Marsh and water species		14		
Total Coco Island species				358

The subjoined table exhibits the relationship that subsists between the systematic disposition of the species and their habit and habitat.

TABLE V. *Relationship between systematic arrangement, habit and habitat.*

HABIT.					SYSTEMATIC ARRANGEMENT.	HABITAT.								
Total.	Climbers.	Trees.	Shrubs.	Herbs.		Cultivated sp.	Weeds.	Forest sp.	Marsh.	Littoral.	Marine.	Epiphytic.	Parasitic etc.	Total.
1	...	1	...	...	Anonaceæ	...	...	1	...	...	...	...	...	1
2	2	...	...	...	Menispermaceæ	...	...	2	...	...	...	...	...	2
1	...	...	...	1	Nymphæaceæ	...	...	...	1	...	...	...	...	1
2	2	...	...	...	Capparideæ	...	...	2	...	...	...	...	...	2
1	...	1	...	...	Violaceæ	...	...	1	...	...	...	...	...	1
2	...	2	...	...	Guttiferæ	...	...	1	...	1	...	...	...	2
2	...	2	...	...	Dipterocarpeæ	...	...	2	...	...	...	...	...	2
8	...	3	2	3	Malvaceæ	2	2	2	...	2	...	...	...	8
8	1	7	...	...	Sterculiaceæ	...	...	6	...	2		...	...	8
4	...	1	3	...	Tiliaceæ	...	...	4	...	...	...	...	...	4
1	...	...	1	...	Rutaceæ	...	...	1	...	...	...	...	...	1
2	...	2	...	...	Burseraceæ	...	...	2	...	...	...	...	...	2
4	...	4	...	...	Meliaceæ	...	...	3	...	1	...	...	...	4
3	2	1	...	...	Olacineæ	...	...	3	...	...	...	...	...	3
3	1	1	1	...	Celastrineæ	...	...	2	...	1	...	...	...	3
3	3	...	...	...	Rhamneæ	...	...	2	...	1	...	...	...	3
5	3	...	2	...	Ampelideæ	...	...	4	...	1	...	...	...	5
5	...	4	1	...	Sapindaceæ	...	...	5	...	...	...	...	...	5
6	...	6	...	...	Anacardiaceæ	...	...	5	...	1	...	...	...	6
1	...	1	...	...	Moringeæ	1	...	...	...	...	...	...	...	1
1	...	1	...	...	Connaraceæ	...	...	1	...	...	...	...	...	1
34	18	6	7	3	Leguminosæ	3	2	19	...	10	...	...	...	34
5	...	5	...	...	Rhizophoreæ	...	...	...	...	5	...	...	...	5
5	1	3	1	...	Combretaceæ	...	...	2	...	3	...	...	...	5
2	...	2	...	...	Myrtaceæ	...	...	...	...	2	...	...	...	2
1	...	...	1	...	Melastomaceæ	...	...	1	...	...	...	...	...	1
3	...	2	1	...	Lythraceæ	...	...	2	...	1	...	...	...	3
2	1	...	...	1	Passifloreæ	1	...	1	...	...	...	...	...	2
1	1	...	...	...	Cucurbitaceæ	...	...	1	...	...	...	...	...	1
1	...	...	...	1	Ficoideæ	...	...	...	...	1	...	...	...	1
13	2	6	5	...	Rubiaceæ	...	...	9	...	4	...	...	...	13
7	1	...	1	5	Compositæ	...	3	2	...	2	...	...	...	7
1	...	...	...	1	Goodenovieæ	...	...	...	...	1	...	...	...	1
2	...	2	...	...	Myrsineæ	...	...	...	...	1	...	...	...	1
1	...	1	...	...	Sapotaceæ	...	...	...	...	1	...	...	...	1
1	...	1	...	...	Ebenaceæ	...	...	1	...	...	...	...	...	1
7	2	2	2	1	Apocyneæ	...	...	4	...	3	...	...	...	7
4	4	...	...	...	Asclepiadaceæ	...	...	...	...	1	...	3	...	4
1	...	...	...	1	Gentianaceæ	...	...	...	1	...	...	...	...	1
2	...	2	...	...	Boragineæ	...	...	...	...	2	...	...	...	2
14	14	...	...	...	Convolvulaceæ	2	...	3	...	9	...	...	...	14
3	...	...	1	2	Solanaceæ	2	...	...	...	1	...	...	...	3
1	...	...	...	1	Scrophularineæ	...	1	...	...	...	...	...	...	1
2	...	2	...	...	Bignoniaceæ	...	...	2	...	...	...	...	...	2
7	1	...	...	6	Acanthaceæ	...	1	3	1	2	...	...	...	7

HABIT.					SYSTEMATIC ARRANGEMENT.	HABITAT.								
Total.	Climbers.	Trees.	Shrubs.	Herbs.		Cultivated sp.	Weeds.	Forest sp.	Marsh.	Littoral.	Marine.	Epiphytic.	Parasiticate.	Total.
8	2	3	2	1	Verbenaceæ	...	...	2	1	5	...	...	...	8
1	...	...	...	1	Labiatæ	...	..	...	1	...	...	..	...	1
3	1	1	...	1	Nyctagineæ	...	..	...	..	3	...	...	...	3
3	...	...	...	3	Amarantaceæ	2	1	...	...	...	...	...	...	3
1	...	...	...	1	Polygonaceæ	...	...	...	1	...	...	...	...	1
2	1	...	...	1	Aristolochiaceæ	...	...	2	...	.	...	...	...	2
1	1	..	...	..	Piperaceæ	...	...	1	...	...	...	...	...	1
2	...	2	...	...	Myristiceæ	..	...	2	...	...	...	...	...	2
3	1	2	...	...	Laurineæ	...	...	1	...	1	...	...	1	3
1	...	...	...	1	Loranthaceæ	...	...	...	...	...	...	..	1	1
1	...	1	..	...	Santalaceæ	...	...	...	...	1	...	...	...	1
15	...	...	13	2	Euphorbiaceæ	...	1	13	...	1	...	...	...	15
11	1	10	...	...	Urticaceæ	...	...	11	...	...	...	...	...	11
1	...	1	...	...	Cycadaceæ	...	...	...	..	1	...	...	...	1
5	...	..	...	5	Orchidaceæ	...	...	1	...	...	...	4	...	5
3	..	...	...	3	Scitamineæ	1	...	2	...	.	...	...	..	3
1	...	...	...	1	Amaryllidaceæ	...	...	...	...	1	...	...	...	1
1	...	...	...	1	Taccaceæ	...	...	...	...	1	...	...	..	1
2	2	...	...	...	Dioscoreaceæ	...	...	2	..	...	...	...	...	2
5	3	...	1	1	Liliaceæ	...	...	4	...	1	...	...		5
3	...	...	...	3	Commelynaceæ	...	...	3	...		...	...	...	3
1	1	...	...	...	Flagellarieæ	...	...	...	...	1	...	...	...	1
6	2	3	1	...	Palmeæ	1	...	4	...	1	...	...	...	6
1	...	...	1	...	Pandanaceæ	...	...	...	...	1	...	...	..	1
4	2	...	...	2	Aroideæ	...	...	2	...	...	...	2	...	4
2		...	...	2	Naiadaceæ	...	...	...	1		1	...		2
10	...	...	...	10	Cyperaceæ	...	2	3	4	1	...	...	...	10
15	...	...	1	14	Gramineæ	...	5	6	2	2	...	...	...	15
10	2	...	...	8	Filices	...	...	1	1	..	...	8	...	10
1	..		..	1	Characeæ	...	...	...	1	...	...	...	...	1
2	...	...	...	2	Musci	...	...	...	...	...	...	2	...	2
2	..	...	..	2	Hepaticæ	...	...	...	...	...	...	2	...	2
4	...	...	...	4	Lichenes	...	...	...	...	...	...	...	4	4
24	...	...	...	24	Fungi	...	...	1	...	...	...	...	23	24
18	...	...	...	18	Algæ	...	...	...	...		18	...	...	18
358	78	94	48	138	TOTALS ...	15	18	162	14	80	19	21	29	358

In considering the distribution of the species in this list it has to be borne in mind that the islands in which they have been collected form an integral portion of the phytogeopraphic province of South-Eastern Asia—an area comprising the Indian Peninsula and Ceylon, the lower slopes of the Himalaya—particularly its eastern and central portion, South China, Indo-China and Malaya. To this area too apparently ought to be added, at least as regards many littoral species and many species with succulent fruits, Northern Australia. While, therefore, in the table of distribution the occurrence of the species in the large divisions of the globe are given on the left hand side, on the right hand the distribution within South-Eastern Asia itself is given. Further, since the geographical position of these islands indicates that they are an integral portion of the Andaman chain, and as the Andamans altogether form as it were part of the debatable land between Indo-China and Malaya, the occurrence of the species there is also noted. In all cases where the occurrence of a species in the Andamans is, at least so far as we yet know, only due to its presence in the Coco Islands, the species in question is indicated by [ ] brackets. The other debatable territory, so far as Malaya and Indo-China are concerned, is Tenasserim, and in all cases where the occurrence of a Coco Island species in Indo-China depends entirely on its occurrence in Tenasserim it is marked by the same [] brackets in the Indo-Chinese column. Similarly when, as is frequently the case, a species is only African in the sense of occurring in the Mascarene Islands, the same [] brackets are used in the African column.

TABLE VI. *Distribution of the species observed in the Coco Group.*

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Section.			Eastn. Section.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
—	—	—	—	—	×	—	Milinsa sp.	—	×	—	—	—
×	×	—	—	×	×	×	Cyclea peltata	—	×	—	—	—
—	—	—	—	—	×	—	Antitaxis calocarpa ...	—	×	—	—	—
×	×	×	—	×	×	×	Nymphæa Lotus	×	×	—	—	—
—	—	—	—	×	×	×	Capparis sepiaria *var.* grandifolia	—	×	—	—	—
—	—	—	—	×	×	—	Capparis tenera *var.* latifolia ...	—	×	—	—	—
—	—	—	—	×	×	—	Alsodeia bengalensis ...	—	×	—	—	—
—	—	—	—	—	[×]	—	Garcinia sp.	—	×	—	—	—
×	×	—	×	×	×	×	Calophyllum inophyllum ...	[×]	×	×	×	—
—	—	—	—	×	×	×	Dipterocarpus pilosus ...	—	×	—	—	—
—	—	—	—	×	×	×	Dipterocarpus alatus ...	—	×	—	—	—
×	×	×	×	×	×	×	Sida acuta	×	×	×	×	×
×	×	×	×	×	×	×	Urena lobata	×	×	×	×	×
×	×	×	×	×	×	×	Hibiscus Sabdariffa ...	×	×	×	×	×
×	×	×	×	×	×	×	Hibiscus Abelmoschus ...	×	×	×	×	×
×	×	—	×	×	×	×	Hibiscus tilliaceus ...	×	×	×	×	×
×	×	—	—	×	×	×	Thespesia populnea ...	×	×	×	×	—
—	×	—	—	×	×	—	Bombax insigne	—	×	—	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Section.			Eastn. Section.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
×	×	×	×	×	×	×	Eriodendron anfractuosum ...	×	×	—	—	×
—	×	×	—	—	[×]	—	Sterculia villosa ...	—	×	—	—	—
—	—	—	—	—	×	—	Sterculia rubiginosa *var.* glabrescens ...	—	×	—	—	—
—	—	—	—	×	×	×	Sterculia parviflora ...	—	×	—	—	—
—	×	×	—	×	×	×	Sterculia alata ...	—	×	—	—	—
×	×	—	—	×	[×]	—	Sterculia colorata ...	—	×	—	—	—
—	—	—	—	×	×	×	Sterculia campanulata ...	—	×	—	—	—
×	×	—	×	×	×	×	Heritiera littoralis ...	×	×	×	×	—
—	—	—	—	[×]	×	—	Buettneria andamanensis ...	—	×	—	—	—
×	×	—	—	×	×	×	Berrya Ammonilla ...	—	×	—	—	—
×	×	×	—	×	×	×	Grewia lævigata ...	×	×	×	—	—
—	—	—	—	—	×	—	Grewia calophylla ...	—	×	—	—	—
×	×	×	×	×	×	×	Grewia Microcos ...	—	×	—	—	—
×	×	×	×	×	×	×	Glycosmis pentaphylla ...	—	×	×	—	—
—	×	×	—	×	×	×	Garuga pinnata ...	—	×	—	—	—
—	—	—	—	—	×	—	Canarium euphyllum ...	—	×	—	—	—
—	—	—	—	—	×	—	Aglaia andamanica ...	—	×	—	—	—
×	×	×	×	×	×	×	Amoora Rohituka ...	—	×	—	—	—
×	×	—	—	×	×	×	Carapa moluccensis ...	×	×	×	×	—
×	×	—	—	—	×	×	Chickrassia tabularis ...	—	×	—	—	—
×	×	—	×	×	×	×	Cansjera Rheedii ...	—	×	×	—	—
—	—	—	—	×	×	—	Phlebocalymna Lobbiana ...	—	×	—	—	—
—	—	—	—	?	×	—	Sarcostigma Wallichii ...	—	×	—	—	—
—	—	—	—	[×]	[×]	—	Glyptopetalum calocarpum ...	—	×	—	—	—
×	×	—	—	×	×	×	Salacia prinoides... ...	—	×	—	—	—
—	—	—	—	[×]	[×]	×	Siphonodon celastrineus ...	—	×	—	—	—
—	×	×	—	×	×	×	Ventilago calyculata ...	—	×	—	—	—
×	×	×	—	×	×	×	Zizyphus Œnoplia ...	—	×	×	—	—
×	×	—	×	×	×	×	Colubrina asiatica ...	×	×	×	×	—
—	—	—	—	×	×	—	Vitis pentagona	—	×	—	—	—
×	×	×	—	×	×	×	Vitis carnosa	—	×	×	—	—
×	×	—	—	×	×	×	Vitis pedata	—	×	—	—	—
×	×	×	—	×	×	×	Leea sambucina	×	×	×	×	—
—	—	×	×	×	×	×	Leea hirta	—	×	—	—	—
—	×	×	—	×	×	×	Erioglossum edule ...	—	×	×	—	—
×	×	—	×	×	×	×	Allophylus Cobbe ...	—	×	×	—	—
—	×	×	—	×	[×]	—	Sapindus Danura ...	—	×	—	—	—
×	—	—	—	×	×	×	Pometia tomentosa ...	—	×	—	—	—
×	×	×	×	×	×	×	Dodonæa viscosa	×	×	×	×	×
×	×	×	—	×	×	—	Odina Wodier	—	×	—	—	—
—	—	—	—	[×]	[×]	—	Parishia insignis	—	×	—	—	—
—	—	—	—	×	[×]	—	Semecarpus subpanduriformis	—	×	—	—	—
—	—	—	—	—	×	×	Semecarpus heterophyllus ...	—	×	—	—	—
×	×	×	×	×	×	×	Spondias mangifera ...	—	×	—	—	—
—	—	—	×	×	×	×	Gracontomelum mangiferum	—	×	—	×	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Section.			Eastn. Section.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
×	×	×	×	×	×	×	Moringa pterygosperma	×	×	[×]	[×]	[×]
—	—	—	—	—	×	×	Connarus gibbosus	—	×	—	—	—
—	×	×	—	×	×	—	Crotalaria sericea	—	×	—	—	—
×	×	—	×	×	×	×	Desmodium umbellatum	×	×	×	×	—
×	×	×	×	×	×	×	Desmodium triquetrum	×	×	—	—	—
—	—	—	×	×	×	×	Desmodium laxiflorum	—	×	—	—	—
×	×	×	×	×	×	×	Desmodium polycarpum	×	×	×	×	—
×	×	×	×	×	×	×	Desmodium triflorum	×	×	×	×	×
×	×	×	×	×	×	×	Alysicarpus vaginalis	×	×	×	×	×
?	?	?	?	?	×	?	Phaseolus sp.	—	×	—	—	—
×	×	×	×	×	×	×	Abrus precatorius	×	×	×	×	×
×	[illegible]	×	—	×	×	×	Abrus pulchellus	—	×	—	—	—
×	×	×	×	×	×	×	Erythrina indica	[×]	×	×	×	—
—	×	—	—	—	×	×	Mucuna gigantea	[×]	×	×	×	—
×	×	×	×	×	×	×	Mucuna pruriens	×	×	×	×	×
—	—	—	—	[×]	[×]	×	Pueraria Candollei	—	×	—	—	—
—	—	×	×	×	×	×	Pueraria phaseoloides	—	×	—	—	—
×	×	—	×	×	×	×	Canavalia obtusifolia	×	×	×	×	×
—	—	—	×	×	×	×	Vigna lutea	×	×	×	×	×
—	×	—	×	×	×	×	Pterocarpus indicus	—	×	—	—	—
×	×	×	×	×	×	×	Derris scandens	—	×	×	—	—
×	—	—	—	×	×	×	Derris sinuata	—	×	—	—	—
×	×	×	×	×	×	×	Derris uliginosa	×	×	×	×	—
×	×	—	×	×	×	×	Pongamia glabra	[×]	×	×	×	—
×	×	—	×	×	×	×	Sophora tomentosa	×	×	×	×	×
×	—	—	—	[×]	×	×	Mezoneuron enneaphyllum	—	×	—	—	—
×	×	×	×	×	×	×	Cæsalpinia Bonducella	×	×	×	×	×
×	×	—	×	×	×	×	Cæsalpinia Nuga	—	×	×	×	—
×	×	×	×	×	×	×	Tamarindus indica	×	×	×	×	×
×	×	—	—	[×]	×	×	Cynometra ramiflora	—	×	×	—	—
×	×	×	×	×	×	×	Entada scandens	×	×	×	×	×
×	×	×	×	×	×	×	Adenanthera pavonina	—	×	—	—	—
×	×	×	×	×	×	×	Acacia concinna	—	×	—	—	—
×	×	×	—	×	×	×	Acacia pennata	×	×	—	—	—
×	×	×	×	×	×	×	Albizzia Lebbek	×	×	×	—	—
—	×	×	—	×	×	×	Albizzia procera	—	×	—	—	—
×	×	—	—	×	×	×	Rhizophora mucronata	×	×	×	×	—
×	×	—	—	×	×	×	Rhizophora conjugata	—	×	—	—	—
×	×	—	—	×	×	×	Ceriops Candolleana	—	×	×	—	—
—	—	—	—	×	×	×	Ceriops Roxburghiana	—	×	—	—	—
×	×	—	×	×	×	×	Bruguiera gymnorhiza	[×]	×	×	×	—
—	—	—	—	—	×	×	Terminalia Catappa	—	×	—	—	—
—	—	—	—	[×]	×	—	Terminalia bialata	—	×	—	—	—
×	×	—	—	×	×	×	Lumnitzera racemosa	×	×	×	×	—
—	—	—	—	[×]	×	—	Illigera Conyzadenia	—	×	—	—	—
—	×	—	—	—	×	×	Gyrocarpus Jacquinii	×	×	×	×	×
×	[×]	—	—	—	×	×	Barringtonia speciosa	[×]	×	×	×	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Section.			Eastn. Section.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
—	×	—	—	×	×	×	Barringtonia racemosa ...	×	×	—	×	—
×	—	—	—	×	×	×	Memecylon edule ...	—	×	—	—	—
×	×	—	×	×	×	×	Pemphis acidula	×	×	×	×	—
—	—	—	—	—	×	—	Lagerstrœmia hypoleuca ...	—	×	—	—	—
—	—	—	—	—	[×]	—	Lagerstrœmia sp. ...	—	×	—	—	—
—	—	—	—	—	×	×	Modecca cordifolia ...	—	×	—	—	—
×	×	×	×	×	×	×	Carica Papaya	×	×	×	×	×
×	×	×	—	×	×	×	Trichosanthes palmata ...	—	×	×	—	—
×	×	—	×	×	×	×	Sesuvium Portulacastrum ...	×	×	×	×	×
—	—	—	—	×	×	×	Stephegyne diversifolia ...	—	×	—	—	—
—	×	×	—	×	×	×	Mussænda calycina ...	—	×	—	—	—
—	—	—	—	—	×	—	Webera Kurzii	—	×	—	—	—
—	—	—	—	×	×	×	Randia longiflora ...	—	×	—	—	—
—	—	—	—	×	×	×	Diplospora singularis ...	—	×	—	—	—
×	×	—	×	×	×	×	Guettarda speciosa ...	×	×	×	×	—
—	—	—	—	—	×	×	Ixora grandiflora *var.* Kurzeana	—	×	—	—	—
—	—	—	—	—	×	—	Ixora brunnescens ...	—	×	—	—	—
—	—	—	—	×	×	—	Ixora cuneifolia	—	×	—	—	—
×	×	×	×	×	×	×	Pavetta indica	—	×	×	—	—
×	×	—	—	—	×	×	Morinda citrifolia *var.* bracteata	—	×	—	—	—
—	—	—	—	×	[×]	—	Psychotria adenophylla ...	—	×	—	—	—
—	—	×	—	×	×	×	Pæderia fœtida	—	×	—	—	—
×	×	×	×	×	×	×	Vernonia cinerea ...	×	×	×	×	×
—	×	—	×	×	[×]	—	Vernonia divergens ...	—	×	—	—	—
×	×	×	×	×	×	×	Adenostemma viscosum ...	×	×	×	×	×
×	×	×	×	×	×	×	Ageratum conyzoides ...	×	×	×	×	×
—	×	—	—	×	[×]	×	Blumea virens	—	×	—	—	—
—	—	—	×	×	×	×	Pluchea indica	—	×	—	—	—
×	×	—	×	×	×	×	Wedelia scandens ...	×	×	×	×	—
×	×	—	×	×	×	×	Scævola Kœnigii ...	—	×	×	×	—
×	×	×	×	×	×	×	Ardisia humilis	—	×	—	—	—
×	×	—	×	×	×	×	Ægiceras majus	—	×	×	×	—
—	—	—	—	—	×	—	Mimusops littoralis ...	—	×	—	—	—
—	—	—	—	—	×	—	Diospyros Kurzii ...	—	×	—	—	—
×	×	×	—	×	×	×	Rauwolfia serpentina ...	—	×	—	—	—
×	×	—	×	×	×	×	Cerbera Odollam ..	—	×	×	×	—
×	×	—	—	×	×	×	Ochrosia borbonica ...	[×]	×	—	—	—
—	—	—	—	—	×	—	Tabernæmontana crispa ...	—	×	—	—	—
—	×	—	—	[×]	×	—	Strophanthus Wallichii ...	—	×	—	—	—
×	×	—	—	×	×	×	Anodendron paniculatum ...	—	×	—	—	—
×	×	×	—	—	×	×	Chonemorpha macrophylla ...	—	×	—	—	—
—	[×]	—	—	×	×	×	Sarcolobus globosus ...	—	×	—	—	—
—	—	—	—	×	×	×	Hoya parasitica	—	×	—	—	—
—	—	—	—	×	×	×	Hoya diversifolia ...	—	×	—	—	—
—	—	—	—	×	×	×	Dischidia nummularia ...	—	×	×	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.			Eastn. Sectn.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
×	×	×	—	×	×	×	Limnanthemum indicum ...	×	×	×	×	—
×	×	—	—	×	×	×	Cordia subcordata ...	×	×	×	×	—
×	×	—	×	×	×	×	Tournefortia argentea ...	×	×	×	×	—
×	×	×	—	×	×	×	Erycibe paniculata ...	—	×	×	—	—
×	×	—	—	×	×	×	Argyreia tiliæfolia ...	—	×	×	—	—
—	—	×	—	×	×	—	Argyreia Hookeri ...	—	×	—	—	—
—	—	—	—	[×]	[×]	—	Argyreia lanceolata ...	—	×	—	—	—
—	—	—	—	[×]	[×]	—	Lettsomia peguensis ...	—	×	—	—	—
×	×	—	—	×	×	×	Ipomæa grandiflora ...	×	×	—	×	—
×	×	×	×	×	×	×	Ipomæa coccinea	×	×	×	×	×
×	×	×	×	×	×	×	Ipomæa Batatas	×	×	×	×	×
×	×	—	×	×	×	×	Ipomæa digitata	×	×	×	×	×
×	—	—	—	×	×	×	Ipomæa denticulata ...	[×]	×	×	×	—
×	×	×	×	×	×	×	Ipomæa Turpethum ...	×	×	×	×	—
×	×	—	×	×	×	×	Ipomæa biloba	×	×	×	×	×
×	×	—	×	×	×	×	Convolvulus parviflorus ...	—	×	×	—	—
—	—	—	—	[×]	×	—	Porana spectabilis ...	—	×	×	—	—
×	×	×	×	×	×	×	Solanum Melongena ...	×	×	—	×	×
×	×	×	×	×	×	×	Physalis minima	×	×	×	×	×
×	×	×	×	×	×	×	Capsicum minimum ...	—	×	×	—	—
×	×	×	×	×	×	×	Scoparia dulcis	×	×	—	×	×
×	×	×	—	×	×	×	Oroxylum indicum ...	—	×	×	—	—
—	—	—	—	×	×	—	Heterophragma adenophyllum	—	×	—	—	—
—	—	—	—	×	×	×	Thunbergia laurifolia ...	—	×	—	—	—
×	×	×	—	×	×	×	Hygrophila quadrivalvis ...	—	×	—	—	—
—	—	—	—	[×]	[×]	—	Strobilanthes phyllostachyus	—	×	—	—	—
×	—	—	—	[×]	×	×	Eranthemum album ...	—	×	—	—	—
—	—	—	—	—	×	?	Eranthemum succifolium ...	—	×	—	—	—
×	×	×	×	×	×	×	Rungia parviflora *var.* pectinata	—	×	—	—	—
—	—	—	—	—	×	×	Peristrophe acuminata ...	—	×	×	—	—
×	×	×	×	×	×	×	Lippia nodiflora	×	×	×	×	×
×	×	—	×	×	×	×	Premna integrifolia ...	—	×	?	?	—
—	—	—	—	—	×	—	Premna sp. (? *P. obtusifolia*) ...	—	×	?	—	—
×	×	×	×	×	×	×	Vitex Negundo	×	×	—	—	—
×	×	—	—	×	×	×	Vitex pubescens	—	×	—	—	—
—	—	—	—	—	×	?	Vitex Wimberleyi (? *V. Sumatrana*)	—	×	—	—	—
×	×	—	×	×	×	×	Clerodendron inerme ...	—	×	×	×	—
×	×	—	×	×	×	×	Avicennia officinalis ...	×	×	×	—	×
×	×	×	×	×	[×]	×	Anisomeles ovata ...	—	×	—	—	—
×	×	×	×	×	×	×	Boerhaavia repens ...	×	×	×	×	—
×	×	—	×	×	×	×	Pisonia aculeata	×	×	×	—	×
—	—	—	—	—	×	×	Pisonia excelsa	—	×	—	—	—
×	×	×	×	×	×	×	Celosia cristata	×	×	—	—	×
×	×	×	×	×	×	×	Achyranthes aspera ...	×	×	×	×	×

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.			Eastn. Sectn.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
×	×	—	—	×	×	×	Achyranthes aspera *var.* porphyristachya	—	×	—	—	—
×	×	×	×	×	×	×	Gomphrena globosa ...	×	×	×	×	×
×	×	×	×	×	×	×	Polygonum barbatum ...	×	×	×	—	—
—	—	—	—	×	×	×	Bragantia tomentosa ...	—	×	—	—	—
×	×	×	×	×	×	×	Aristolochia tagala ...	—	×	—	—	—
—	—	—	—	[×]	×	×	Piper caninum	—	×	—	—	—
×	—	—	—	[×]	×	×	Myristica Irya	—	×	—	—	—
—	—	—	—	—	×	×	Myristica glauca	—	×	—	—	—
—	—	—	—	—	×	—	Dehaasia Kurzii	—	—	—	—	—
×	×	—	×	×	×	×	Hernandia peltata ...	[×]	×	×	×	—
×	×	×	×	×	×	×	Cassytha filiformis ...	×	×	×	×	×
×	×	×	—	×	×	×	Loranthus longiflorus ...	—	×	—	—	—
—	—	—	—	[×]	×	×	Champereia Griffithiana ...	—	×	—	—	—
×	×	—	×	×	×	×	Euphorbia Atoto	—	×	×	×	—
×	×	×	×	×	×	×	Euphorbia pilulifera ...	×	×	×	×	×
—	—	—	—	—	×	—	Bridelia Kurzii	—	×	—	—	—
×	×	×	×	×	×	×	Bridelia tomentosa ...	—	×	×	—	—
—	—	—	—	[×]	[×]	—	Phyllanthus columnaris ...	—	×	—	—	—
×	×	×	×	×	×	×	Flueggia microcarpa ...	×	×	×	×	—
—	—	×	—	×	[×]	—	Cyclostemon assamicus ...	—	×	—	—	—
—	—	—	—	×	×	—	Aporosa villosula ...	—	×	—	—	—
—	—	—	—	[×]	×	—	Croton sublyratus ...	—	×	—	—	—
—	—	—	—	—	×	—	Blachia andamanica ...	—	×	—	—	—
—	—	—	—	—	×	×	Claoxylon longifolium ...	—	×	—	—	—
—	—	—	—	[×]	×	×	Mallotus acuminatus ...	—	×	—	—	—
—	—	—	—	—	×	—	Mallotus andamanicus ...	—	×	—	—	—
—	—	—	—	—	×	×	Macaranga Tanarius ...	—	×	—	—	—
—	—	—	—	×	×	×	Cnesmone javanica ...	—	×	—	—	—
×	×	—	—	×	×	×	Phyllochlamys spinosa ...	—	×	—	—	—
—	—	—	—	[×]	×	—	Plecospermum andamanicum	—	×	—	—	—
—	×	×	—	×	×	×	Ficus Benjamina	—	×	×	—	—
—	×	×	—	×	×	×	Ficus Rumphii	—	×	—	—	—
×	×	×	×	×	×	×	Ficus retusa *var.* nitida ...	—	×	×	—	—
—	—	—	—	—	×	×	Ficus brevicuspis	—	×	—	—	—
×	×	—	—	×	×	×	Ficus callosa	—	×	—	—	—
×	×	×	×	×	×	×	Ficus hispida	—	×	×	—	—
—	—	—	—	[×]	[×]	—	Ficus grisea	—	×	—	—	—
×	×	—	—	×	×	×	Antiaris toxicaria ...	—	×	—	—	—
—	—	—	—	—	×	×	Artocarpus Gomeziana ...	—	×	—	—	—
—	—	—	—	[×]	×	×	Cycas Rumphii	—	×	×	—	—
—	—	—	—	×	×	×	Dendrobium secundum ...	—	×	—	—	—
×	×	—	—	—	×	×	Calanthe veratrifolia ...	—	×	×	—	—
×	×	×	—	×	[×]	—	Dorites Wightii	—	×	—	—	—
—	×	×	—	[×]	[×]	—	Ærides multiflorum ...	—	×	—	—	—
×	×	×	—	×	×	×	Pholidota imbricata ...	—	×	—	—	—
×	×	×	×	×	×	×	Costus speciosus	—	×	—	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.			Eastn. Sectn.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
—	—	—	—	—	[×]	—	Zingiber sp.	—	×	—	—	—
×	×	×	×	×	×	×	Musa sapientum	×	×	×	×	×
×	×	—	—	×	×	×	Crinum asiaticum ...	—	×	×	×	—
×	×	—	—	×	×	×	Tacca pinnatifida	×	×	×	×	—
×	×	×	—	×	×	×	Dioscorea glabra	—	×	—	—	—
×	×	×	—	×	×	×	Dioscorea pentaphylla ...	—	×	—	—	—
—	×	—	—	×	×	—	Smilax macrophylla ...	—	×	—	—	—
×	×	×	—	×	×	×	Asparagus racemosus ...	—	×	—	—	—
—	—	—	—	×	×	×	Dracæna angustifolia ...	—	×	×	—	—
×	×	×	×	×	×	×	Dracæna spicata	—	×	—	—	—
×	×	×	×	×	×	×	Gloriosa superba	—	×	—	—	—
—	—	—	—	×	×	×	Pollia zorzogonensis ...	—	×	—	—	—
×	×	×	×	×	×	×	Commelina obliqua ...	—	×	—	—	—
—	—	—	—	×	×	×	Aneilema ovatum ...	—	×	—	—	—
×	×	—	—	×	×	×	Flagellaria indica ...	×	×	×	—	—
—	—	—	—	×	×	×	Caryota sobolifera ...	—	×	—	—	—
—	—	—	—	—	×	—	Corypha elata	—	×	—	—	—
—	—	—	—	—	[×]	-	Livistona sp.	—	×	—	—	—
—	—	—	—	×	×	—	Calamus tigrinus	—	×	—	—	—
—	—	—	—	—	×	—	Calamus andamanicus ...	—	×	—	—	—
×	×	—	—	×	×	×	Cocos nucifera	×	×	×	×	×
×	×	—	—	×	×	×	Pandanus odoratissimus ...	[×]	×	×	—	—
—	—	—	—	—	[×]	-	Amorphophallus sp. ..	—	×	—	—	—
×	×	×	×	×	×	×	Alocasia fornicata ...	—	×	—	—	—
×	×	×	×	×	×	×	Scindapsus officinalis ...	—	×	—	—	—
×	×	×	×	×	×	×	Pothos scandens	—	×	—	—	—
×	×	—	—	×	×	×	Cymodocea ciliata ...	×	×	×	—	—
×	×	×	×	×	×	×	Zanichellia palustris ...	×	×	×	×	×
×	×	×	×	×	×	×	Cyperus polystachyus ...	×	×	×	×	×
×	×	×	×	×	×	×	Cyperus elegans	—	×	—	—	—
×	×	×	×	×	×	×	Cyperus dilutus	—	×	—	—	—
×	×	—	×	×	×	×	Cyperus pennatus ...	[×]	×	×	×	—
×	×	×	×	×	×	×	Kyllinga brevifolia ...	×	×	×	×	×
×	×	×	×	×	×	×	Fimbristylis diphylla ...	×	×	×	×	×
×	×	—	×	×	×	×	Fimbristylis ferruginea ...	×	×	×	×	×
×	×	×	×	×	×	×	Fimbristylis quinqueangularis	×	×	×	—	—
×	×	×	×	×	×	×	Fimbristylis miliacea ...	×	×	×	—	×
×	×	×	×	×	[×]	—	Scirpus subulatus ...	×	×	—	—	—
×	×	×	×	×	×	×	Paspalum scrobiculatum ...	×	×	×	—	—
×	×	×	×	×	×	×	Panicum ciliare	×	×	×	×	—
×	×	×	×	×	×	×	Panicum colonum ...	×	×	×	×	×
×	×	×	×	×	×	×	Panicum Helopus ...	×	×	×	—	—
—	—	—	—	—	×	×	Panicum javanicum ...	—	×	—	—	—
×	×	×	×	×	×	×	Panicum Myurus	×	×	×	×	×
×	×	×	×	×	×	×	Panicum montanum ...	—	×	—	—	—
×	×	×	×	×	×	×	Oplismenus compositus ...	×	×	×	×	×
×	×	—	—	—	×	×	Thuarea sarmentosa ...	[×]	×	×	×	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.		Eastn. Sectn.										
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
×	×	×	×	×	×	×	Ischæmum ciliare	—	×	×	—	—
—	—	—	—	×	×	×	Ischæmum muticum	—	×	×	×	—
×	×	×	×	×	×	×	Andropogon contortus	×	×	×	×	×
×	×	×	×	×	×	×	Eleusine indica	×	×	×	×	×
×	×	×	×	×	×	×	Eleusine ægyptiaca	×	×	×	×	×
—	×	×	×	×	[×]	—	Dendrocalamus strictus	—	×	—	—	—
—	—	—	—	—	×	×	Davallia solida	—	×	×	×	—
×	×	×	×	×	×	×	Adiantum lunulatum	×	×	×	×	×
×	×	×	×	×	×	×	Ceratopteris thalictroides	×	×	—	×	×
×	×	×	×	×	×	×	Polypodium irioides	×	×	×	×	—
×	×	×	×	×	×	×	Polypodium adnascens	×	×	×	×	—
×	×	×	×	×	×	×	Polypodium quercifolium	—	×	×	×	—
×	×	×	×	×	×	×	Vittaria elongata	×	×	×	×	—
×	×	×	×	×	×	×	Acrostichum scandens	—	×	×	×	—
×	×	×	×	×	×	×	Acrostichum appendiculatum	—	×	—	—	—
×	×	×	×	×	×	×	Lygodium flexuosum	×	×	×	—	—
×	×	×	×	×	×	×	Chara fœtida	—	×	—	—	—
×	—	—	—	—	×	×	Calymperes Dozyanum	—	×	—	×	—
×	×	×	×	×	×	×	Bryum coronatum	×	×	×	×	×
—	—	—	—	—	×	—	Lejeunia sp.	—	×	—	—	—
×	×	×	×	×	×	×	Collema nigrescens	×	×	×	×	×
×	×	×	×	×	×	×	Physcia obscura ?	×	×	×	×	×
—	—	—	—	—	×	—	Physcia sp.	—	×	—	—	—
—	—	—	—	—	×	—	Lepraria sp.	—	×	—	—	—
—	—	—	—	—	×	×	Lentinus leucochrous	—	×	—	—	—
×	×	×	—	×	×	×	Lenzites deplanata	—	×	—	—	—
×	×	—	—	×	×	×	Lenzites subferruginea	—	×	—	—	—
—	—	—	—	—	×	×	Polyporus fulvus	—	×	—	—	—
×	×	×	×	×	×	×	Polyporus xanthopus	×	×	×	×	×
×	×	×	×	×	×	×	Polyporus sanguineus	×	×	×	×	×
×	×	×	—	×	×	×	Polyporus grammatocephalus	—	×	×	—	×
×	×	×	×	×	×	×	Polyporus australis	×	×	×	×	×
×	—	—	—	—	×	—	Hexagona pergamenea	—	×	—	—	—
—	—	—	—	—	[×]	—	Hexagona sericeo-hirsuta	—	×	—	—	×
—	—	—	—	—	×	—	Hexagona tenuis	×	×	—	—	—
—	×	—	—	—	×	—	Dedælea flabellum	—	×	—	—	—
—	×	—	—	—	×	—	Dedælea sanguinea	—	×	—	—	—
×	×	×	—	×	×	×	Dedælea quercina	×	×	×	×	×
×	×	×	—	×	×	×	Dedælea concentrica	×	×	×	×	×
×	×	×	×	×	×	×	Thelephora incrustans	×	×	×	×	×
×	×	×	×	×	×	×	Bovista lilacina	×	×	×	×	×
×	×	—	—	×	×	×	Hirneola polytricha	×	×	—	×	×
—	—	—	—	—	[×]	—	Xylaria clavarioides	—	×	—	—	—
—	×	—	—	—	[×]	—	Daldinia vernicosa	—	×	—	—	×
—	—	—	—	—	×	—	Rhytisma sp.	—	×	—	—	—
×	×	—	—	×	×	×	Sargassum ilicifolium	×	×	—	×	×
—	—	—	—	—	×	×	Turbinaria ornata	—	×	—	—	—

DISTRIBUTION IN S. E. ASIA.							NAMES OF SPECIES.	GENERAL DISTRIBUTION.				
Westn. Sectn.			Eastn. Sectn.									
Ceylon.	India.	Himalaya.	S. China.	Indo-China.	Andamans.	Malaya.		Africa.	S. E. Asia.	Australia.	Polynesia.	America.
×	×	—	—	×	×	×	Padina pavonia	×	×	×	×	×
—	—	—	—	—	×	×	Dictyota dichotoma ...	×	×	×	×	×
×	×	—	×	×	×	×	Lithothamnion polymorphum	×	×	×	—	—
×	×	—	—	×	×	×	Acanthophora Thierii ...	×	×	×	×	×
—	—	—	—	—	×	×	Jania tenella	—	×	—	—	—
—	—	—	—	—	×	×	Gracilaria crassa	—	×	—	—	—
×	—	—	—	—	×	×	Gelidium corneum ...	×	×	×	×	×
×	×	—	—	×	×	×	Caulerpa clavifera ...	×	×	×	×	×
—	—	—	—	—	×	×	Caulerpa plumaris ..	—	×	—	—	—
×	×	—	—	×	×	×	Valonia fastigiata ...	×	×	×	×	×
×	×	—	—	×	×	×	Valonia confervoides ...	×	×	×	—	—
×	×	—	—	×	×	×	Halimeda Opuntia ...	×	×	×	×	×
—	—	—	—	—	×	×	Siphonocladus ? filiformis ...	×	×	×	—	—
—	—		—	—	[×]	—	Vaucheria sp. ...	—	×	—	—	—
×	×	—	—	—	×	×	Calothrix pulvinata ...	×	×	×	×	×

Reviewing the general distribution of the flora as given in TABLE VI, we find that of the 358 species, 70 are cosmopolitan in the tropics, 10 more are nearly so, 49 are more or less widely spread throughout the tropics of the old world, 41 extend from South-eastern Asia to Australasia, while 188 species are confined to South-eastern Asia. The subjoined synoptic table indicates these distributional features more exactly and gives at the same time the relationship of this distribution both to the habit and to the habitat of the species.

TABLE VII. *Relationship of General Distribution to Habit and Habitat.*

HABIT.					DISTRIBUTIONAL FEATURES.	HABITAT.								
TOTAL.	Climbers.	Trees.	Shrubs.	Herbs.		Cultivated sp.	Weeds.	Forest sp.	Marsh.	Littoral.	Marine.	Epiphytic.	Parasitic or Saprophytic.	TOTAL.
					Cosmopolitan in the tropics.									
70	14	5	2	49	America, Africa, Asia, Australia, Polynesia	12	16	6	6	12	8	2	8	70
					In tropics of both Hemispheres, but hardly cosmopolitan.									
3	1	1	...	1	America, Africa, Asia, Australia ...	...	...	...	...	2	..	...	1	3
2	...	...	...	2	America, Africa, Asia, Polynesia ...	...	...	...	...	...	1	..	1	2
3	1	1	...	1	America, Africa, Asia	...	...	2	...	...	...	...	1	3
2	...	...	...	2	America, Asia ...	...	...	...	...	..	..	...	2	2
					Widely distributed in Eastern Hemispheres; not in America.									
29	7	13	4	5	Africa, Asia, Australia, Polynesia ...	...	...	2	...	26	...	1	...	29
12	1	3	3	5	Africa, Asia, Australia	...	...	3	3	5	1	...	...	12
2	...	1	...	1	Africa, Asia, Polynesia	...	...	...	...	1	...	1	...	2
6	1	1	2	2	Africa, Asia	...	...	2	1	2	1	...	...	6
					Confined to Asia and Australasia.									
15	2	2	3	8	Asia, Australia, Polynesia ...	...	...	...	...	10	1	3	1	15
23	8	7	6	2	Asia, Australia	...	...	16	..	6	..	1	...	23
3	...	1	...	2	Asia, Polynesia	...	...	2	...	..	...	1	...	3
188	43	59	28	58	South-Eastern Asia only	3	2	129	4	16	7	12	15	188
358	78	94	48	138	TOTALS	15	18	162	14	80	19	21	29	358

In discussing the phytogeographic distribution of these species within the province of South-Eastern Asia it is necessary to distinguish between the districts forming the Western section, *viz.*:—the lower Himalayan slopes with the plains at their foot, Peninsular India, and Ceylon—from the Eastern section, which comprises Southern China, Indo-China, Malaya, including the Philippines, New Guinea, and the coasts of Northern or Tropical Australia. Of the 358 species in the Coco Islands, which therefore necessarily all occur in the Eastern section, 252 species, or 70 per cent., are found in the Western section as well. Of the whole number 153 species, or 43 per cent., extend to Australia, whereas only 140, or 39 per cent., are known to occur in South China.

The following tables indicate the distribution of the species so far as these three portions of S. E. Asia are concerned.

TABLE VIII. *Distribution in* S. E. Asia *of the species extending from the* Coco-group *to* Cis-gangetic India.

In all three Cis-gangetic districts (*Himalaya, India, Ceylon*) :—		134
In China, Indo-China, Malaya, Australia	72	
In Indo-China, Malaya, Australia	9	
In China, Indo-China, Malaya	26	
In Indo-China, Malaya	24	
In China, Indo-China, *Andamans*	1	
In Indo-China, *Andamans*	2	
In *Himalaya* and *India* :		14
In Indo-China, Malaya, Australia	1	
In China, Indo-China, Malaya	1	
In Indo-China, Malaya	7	
In China, Indo-China, *Andamans*	1	
In Indo-China, *Andamans*	3	
In *Andamans*	1	
In *India* and *Ceylon* :—		76
In China, Indo-China, Malaya, Australia	33	
In Indo-China, Malaya, Australia	21	
In Indo-China, Malaya	15	
In Indo-China, *Andamans*	1	
In *Andamans*, Malaya, Australia	3	
In *Andamans*, Malaya	3	
In *Himalaya* :—		5
In China, Indo-China, Malaya	1	
In Indo-China, Malaya	2	
In Indo-China, *Andamans*	2	
In *India* :—		13
In Indo-China, Malaya, Australia	1	
In China, Indo-China, Malaya	1	
In Indo-China, Malaya	3	
In Indo-China, *Andamans*	3	
In *Andamans*, Malaya, Australia	2	
In *Andamans*	3	
In *Ceylon* :—		10
In Indo-China, Malaya, Australia	1	
In Indo, China, Malaya	6	
In *Andamans*, Malaya	2	
In *Andamans*	1	
Total number of species extending from the Coco Group to Cis-gangetic India		**252**

TABLE IX. *Distribution in* S. E. Asia *of the species extending from the* Coco Group *to* China.

Extending as far as *Australia* :—		106
In Indo-China, Malaya, Australia ; *Himalaya, India, Ceylon*	72	
In Indo-China, Malaya, Australia ; *India, Ceylon*	33	
In Indo-China, Malaya, Australia	1	
Extending as far as *Malaya* :—		31
In Indo-China, Malaya ; *Himalaya, India, Ceylon*	26	
In Indo-China, Malaya ; *Himalaya, India*	1	
In Indo-China, Malaya ; *Himalaya*	1	
In Indo-China, Malaya	3	

Extending as far as the *Andamans* only :—		3
In Indo-China, Andamans; *Himalaya, India, Ceylon*	1	
In Indo-China, Andamans; *Himalaya, India*	1	
In Indo-China, Andamans; *India*	1	
Total number of species extending from the Coco Group to China ...		140

TABLE X. *Distribution in* S. E. Asia *of the species extending from the* Coco Group *to* Australia.

Extending as far as *China* :—		106
To Malaya, Indo-China, China; *Himalaya, India, Ceylon*	72	
To Malaya, Indo-China, China; *India, Ceylon*	33	
To Malaya, Indo-China, China	1	
Extending as far as *Indo-China* :—		38
To Malaya, Indo-China; *Himalaya, India, Ceylon*	9	
To Malaya, Indo-China; *Himalaya, India*	1	
To Malaya, Indo-China; *India, Ceylon*	21	
To Malaya, Indo-China; *India*	1	
To Malaya, Indo-China; *Ceylon*	2	
To Malaya, Indo-China	4	
Extending as far as the *Coco Group* (*Andamans*) only :—		9
To Malaya, Andamans; *Ceylon, India*	3	
To Malaya, Andamans; *Ceylon*	1	
To Malaya, Andamans; *India*	2	
To Malaya, Andamans	3	
Total number of species extending from the Coco Group to Australia ...		153

The analysis of these species thus shows that the figures do not indicate any special connection either with China, with India, or with Australia; many of the species in these tables are cosmopolitan or nearly so, and thus possess no special phytogeographical interest. The number of species that extend from India, Ceylon or the Himalaya to the Andamans and no further, is only 23, or 6½ per cent. of the whole flora; this figure, therefore, more nearly represents what may be considered the peculiarly Indian element in the Flora of the Andamans. There are only three species that extend from South China to the Andamans and no further southwards, and as all three are found in India and may as readily be extensions from India to China as from China to India we may assert that there is no distinctive Chinese feature in the flora at all. Only 9 species extend upwards from Australia as far as the Andamans, but not as far as Indo-China; but all these are characteristic Malayan species and may just as well be considered extensions from Malaya to Australia as from Australia through Malaya to the Coco Islands. The occurrence of as many as 10 of the species in Ceylon and not in India would seem at first to indicate that there is some foundation for a remark by Mr. Kurz, already alluded to in connection with the vegetation of Diamond Island (*J. A. S. B.* lix, pt. 2, p. 290), concerning the presence of a Ceylon element in the Andamans flora. But a consideration of that section of TABLE VIII in which they are detailed shows that they afford little corroboration of this hypothesis for there is only one species (*Dedælea flabellum*) restricted to the Andamans and Ceylon, and as this is a *Cryptogam*, too great a reliance ought not to be placed on the fact; Indian *Cryptogams*, other than ferns, have not as yet been assiduously collected and the occurrence here of this Ceylon species perhaps indicates rather a wide dispersion for it than any peculiar affinity of the flora of the group with that of Ceylon.

The general conclusion to which we are led by the evidence these tables afford is, that the flora of the Coco Group is almost purely Transgangetic, and that while this is the case there is no appreciable Chinese or Australian element present. We have still to ascertain whether it is an Indo-Chinese or a Malayan element that prevails in the flora, and to what extent any independent element exists.

From their geographical position we have to look upon the Coco Islands as part of the Andaman Group: in one sense therefore all the Coco Island species are Andamanese. But there are as many as 30 of the species in the list,[*] or about 8 per cent. of the flora, whose presence in the Andamans is due only to their having been found in the Coco Group. At the same time, however, it must be remembered that 19 species, or over 5 per cent. of the flora, are peculiar to the Andamans as a whole, not occurring either in Indo-China or in Malaya, while 24 more are only known as Indo-Chinese from their presence in Tenasserim.[†] Of these 24 Andamans-Tenasserim species, 22, or 6 per cent. of the flora, are confined to these two districts, only two of them extending even as far as the Malay Peninsula. The bearing of this peculiar distribution in the Andamans and in Tenasserim, but neither northward to Indo-China nor southward to Malaya, the writer has already had occasion to note;[‡] it will be referred to again below in connection with the probable origin of the Coco Island flora. Another circumstance that must be borne in mind is that as yet very little is known of the flora of North Andaman, and it is not improbable that some of the 30 *Non-Andaman* Coco species will yet be found to occur in that island.[§]

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[*] Indicated in the list of distribution by [] brackets in the Andamans column.

[†] Indicated by [] brackets in the Indo-Chinese column.

[‡] *Ann. Roy. Bot. Garden*, vol. iii, p. 238.

[§] As an example of this possibility may be instanced *Dendrocalamus Strictus* which does not occur in South Andaman. Mr. Godwin-Austen, formerly of Port Blair, one of the very few officers who have ascended Saddle Peak, the highest point of North Andaman, has informed the writer that at one point in the ascent a Bamboo is met with quite different from the Bamboos near Port Blair; not very

Of the 358 species, 232, making 65 per cent. of the whole, occur at once in Indo-China, Malaya and the Andamans; 40 occur in Malaya and the Andamans, 8 of these extending to Tenasserim but not occurring in Burma or Siam (Indo-China proper); 22 occur in Indo-China but not in Malaya, 12 of them being present in the Andamans also; 40 occur in the Andamans without appearing either in Indo-China or in Malaya, though 8 of these appear in Tenasserim, which connects Indo-China with the Malay Peninsula, just as the Andamans connect Indo-China with the Malay Archipelago; 8 occur only in the Coco Islands and Tenasserim, and 13 are apparently confined to the Coco group. This last number is probably too high; some of these species, as well as some of those others for which the Coco locality is as yet the only record from the Andamans, may occur in North Andaman.

The following table gives the distribution of the species in these three districts as well as in the sub-district of Tenasserim:—

TABLE XII. *Distribution of Coco Island species in the* Indo-Chinese *and* Malayan *districts.*

A.

Species extending from Coco Group to:—

Indo-China,	Tenasserim,	Andamans,	Malaya, ...	232
Indo-China,	Tenasserim,	———,	Malaya, ...	2
———,	Tenasserim,	Andamans,	Malaya, ...	8
———,	Tenasserim,	———,	Malaya, ...	1
———,	———,	Andamans,	Malaya, ...	32
Indo-China,	———,	Andamans,	———, ...	12
———,	Tenasserim,	Andamans,	———, ...	8
Indo-China,	———,	———,	———, ...	10
———,	Tenasserim,	———,	———, ...	8
———,	———,	Andamans,	———, ...	32
			Total species extending from Coco Group ...	345
Species confined to Coco Group			... ...	13
			Total Coco Island species ...	358

B. Species occurring in:—	No. of species.	percentage of flora.
Indo-China	256	71
Tenasserim	259	72
Andamans	324	90
Malaya	275	76
Species confined to Coco Group ...	13	3½

This table therefore leads to the conclusion that phytogeographically

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tall, but extremely hard and tough, and forming dense thickets very difficult to pass through—a general description agreeing very well with that of *Dendrocalamus strictus* as it occurs in Great Coco.

as well as physiographically the Coco Group forms an integral part of the Andamans. Further, it shows that of the possibly predominating elements in their flora, the Indo-Chinese element, as a whole, is slightly weaker even in that part of the Andamans nearest to Burma than is an element indicating a Tenasserim influence and an element indicating a Malayan influence. This seems strange when we recollect that not only do the Cocos form that part of the Andamans nearest to Burma but that there is a shallow ridge, at times raised into islands, along the line between the Cocos and the nearest point on the Burmese mainland, whereas Tenasserim is at the opposite side of a deep sea, while Malaya is separated from the opposite extremity of the Andaman group by a much greater distance and by much deeper straits than Burma is from the area under discussion.

In order, if possible, to account for this peculiarity of distribution, it becomes necessary to discuss the probable origin of the flora of the group.

The first step in such an inquiry is to ascertain the species in a flora that *may* possibly have been introduced and that do not therefore *necessarily* postulate for an isolated locality such as the Cocos any former connection with neighbouring land. It is, of course, evident that if a previous land connection be shewn to be necessary to explain the presence of *any* species in the islands this same land connection would sufficiently explain the presence of most of the species that occur there without requiring the suggestion of any extraneous means of introduction. But until all the possibilities of introduction by means of physical agencies now at work under existing physiographical conditions are completely exhausted, we are not at liberty to assume the existence of dissimilar physiographical conditions or a different application of the present physical agencies.

There is, however, always great difficulty in deciding absolutely what species are indigenous and what species are introduced in any locality, and here no species will be considered "indigenous" for which it is possible to suggest in the remotest fashion any means of introduction. At the risk therefore of including among introduced species many that are probably quite entitled to be termed indigenous, the possibilities are discussed under the headings of the various active introducing agencies. As this involves a use of the terms "indigenous" and "introduced" somewhat different from the sense in which they are generally accepted, it seems better that the possibly introduced species be spoken of as "migrant"; and the certainly indigenous residuary species termed "remanent," many of the "migrant" species being doubtless perfectly "indigenous" in the generally received sense.

Even within the group of "migrant" species difficulties often arise owing to certain species being assisted in one way from island to island over intervening seas and in another way along continuous land. As an example may be mentioned *Gyrocarpus Jacquinii*, whose progress from island to island is clearly a sea-assisted process, yet whose dispersal inland when it is once established is greatly aided by wind because of its curious dipteroid fruit. It might even be suggested that the wings of this fruit may be sufficient to account for its transmission across intervening seas; but no one who has carefully observed the fall of its fruits is likely to consider this possible. Another very pertinent instance is *Terminalia Catappa*, a species distributed by ocean currents over all the coasts of the Andaman Sea, but which nevertheless occurs far inland as well as on the beaches. The explanation of its inland dispersal is extremely simple, for rats and frugivorous bats are extremely fond of the fleshy part of its fruits while they leave uninjured the stone and kernel. Both these animals are apt when disturbed while eating to carry off in their mouths the fruit they may be devouring, ultimately dropping it some distance from the place where the parent tree grew. But though bats occur in far off lonely islands like Batti Malv and Barren Island, and though their presence there indicates the possibility that animals of the kind may, like fruit-eating birds, carry undigested seeds from one island to another, it is clear, since they do not swallow the stones of *Terminalia Catappa* that they are not to be held respossible for the passage of that species across intervening seas. The further spread of these species within new localities by agencies quite distinct from that necessary to account for their initial appearance is, it will be admitted, amply demonstrated.* Other examples are *Pisonia aculeata* and *excelsa* which are perhaps introduced by the sea along these coasts. If they are, however, it is quite certain that their presence inland may be amply accounted for owing to their sticky fruits having become attached to birds or animals that have come in contact with them.†

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* Residents in India are familiar with the treatment of "country-almonds" by the large "flying-foxes;" fruits carried off by them, and with a portion bitten out of the fleshy side, may be constantly found dropped at considerable distances from the trees on which the almonds grew In Barren Island there is no doubt that the frugivorous bats which exist there are partly responsible for the same thing, and the writer had an opportunity of witnessing the rats, which abound on that island, engaged in the same act, these creatures having come down to the shore for the fruits that are common there and when disturbed scampering off up gullies with fruits in their mouths.

† A striking instance of the possibility of their becoming attached to the bodies of passing animals was witnessed by the writer on a path between Rangachang and Ali Musjid in South Andaman in April 1891. Though some miles from the sea a considerable number of *Pisonia excelsa* trees occurred at the place, and the path was strewn with their fruits. A tree-snake was seen which had become entangled in a fallen panicle of these so that all escape was impossible, its every movement in-

And in addition to these instances it may be remarked that the whole group of species which may possibly have been introduced in the crops of grain-eating birds can be only considered as indirectly bird-introduced, since some accident must have happened to account for the death of the introducing bird in order to explain the germination of the seed and final introduction of the plant.

The "migrant" species, meaning thereby all that have certainly been introduced and all for which introduction is conceivable, may be divided into "civilized" species introduced by man, and "sylvestrian" or wild species. The wild species may be divided into "coast" species, further subdivided into "marine" and "littoral" species, the whole of the coast species being sea-introduced; and into "inland" species. These latter, which may of course also occur on the shore, but for the introduction of which the sea has not been responsible, may best be classed as "wind-introduced" and as "bird-introduced" species Species introduced by birds may have been introduced either attached. to the bodies of these or carried in their crops. These different groups will be discussed in detail; last of all the "remanent" species will be considered.

The "civilized" species comprise cultivated plants and weeds of cultivation or of waste places; the former corresponding practically to domestic animals like the cow or horse, and to domestic insects like the bee or silk-worm, the latter to the vermin that associate themselves with, or accompany man and his domestic creatures. This group therefore contains the species that may, directly as economic or æsthetic plants, or indirectly as weeds, have been introduced by man. The list subjoined includes the whole of the species present in the islands that are known to be sometimes thus introduced; those that are likely to be here indigenous, or to have been introduced by other than human agency, are enclosed within brackets and will be found again in one or, at times, more than one of the subsequent lists.

List of Civilized species *found in the Coco Group.*

* Nymphæa rubra.	This variety has perhaps been introduced intentionally into Great Coco, where it occurs in the small lake. It has to be recollected that it is a favourite flower with the Burmese and is sold for votive purposes in the Pagodas

volving it more hopelessly in the tangled sticky mass. After the snake died its body was carefully examined and it was found that it had suffered no previous physical injury which could account for its inability to escape.

	about Rangoon; also that the settlement was attempted by a Rangoon gentleman whose servants were, at least partly, Burmese. But typical white Nymphæa Lotus occurs in Little Coco, clearly independently of human agency.
Sida carpinifolia.	Table Island (the older clearing) only.
[Urena lobata.	As a rule this species would, without hesitation, be dealt with as a weed; in Great Coco, however, it does not occur in the clearing and it was not found on Table Island at all. If introduced here, we may safely say that human agency is not responsible for its appearance; more probably it has been introduced by the agency of birds].
* Hibiscus Sabdariffa	Great Coco; in the old garden and evidently struggling against extinction.
5. * Hibiscus Abelmoschus.	Table Island only; but common in many parts of the clearing.
* Moringa pterygosperma.	Great Coco; a few trees evidently planted; these are very healthy, and seedlings are already springing up under the adjacent Coco-nut trees.
* Crotalaria sericea.	Table Island only; but very abundant; the species may have been unintentionally introduced, but more probably has been brought by the servants at the light-house, who are Burmans and with whom the flower is a favourite.
* Desmodium triflorum.	Table Island only; common however on all the grassy slopes.
* Alysicarpus vaginalis.	Great Coco; not seen on Table Island, though it probably occurs there.
10. * Phaseolus sp.	Seedlings in cow-dung on one grassy slope at south-west corner of island. These were seen in 1890; no species was seen in 1889 likely to have given origin to these and there is no indigenous species to which it seems likely they could belong. Unfortunately

	neither clearing could be revisited in 1890 to enable the writer to make further investigation.
* Tamarindus indica.	Great Coco; only one tree and that, though almost certainly introduced by man probably unintentionally so.
* Carica Papaya.	Great Coco; perfectly naturalised and very profuse in the Coco-nut zone, especially in the north end of the island.
[Vernonia cinerea.	Both islands; extremely abundant in the clearings, but also plentiful on grassy slopes and bare rocky headlands of the western coast of Great Coco; it also occurs on Rutland Island, at the opposite extremity of the Andaman group, where introduction by man is hardly conceivable: here probably it owes its presence to the agency of wind.]
[Adenostemma viscosum.	Great Coco; common on bare rocky promontories on west side and at north end of island. If introduced here it has been introduced independently of human agency; it is probably a sea-introduced species, but perhaps its fruits *may* have come attached to the feathers of birds.]
15. * Ageratum conyzoides.	Table Island; common in the clearing; not present in Great Coco.
* Ipomæa coccinea.	Table Island; a garden escape, but very plentiful on the edges of jungle-paths far from the lighthouse garden.
* Ipomæa Batatas.	Table Island; cultivated only: has not survived on Great Coco, probably owing to the presence of wild pigs. These the writer did not see on Great Coco but their traces were abundant on Table Island and the pigs themselves were obtained on Little Coco. Moreover, Mr. Hume (*Stray Feathers*, ii, p. 111) actually met with them on Great Coco. During our visits 5 or 6 abandoned pariah dogs were seen

	on the island ; but, though these must necessarily have rendered the pigs shy, it can hardly be supposed that they have exterminated them.
* Solanum Melongena.	Table Island ; cultivated. Great Coco ; in the old garden and also plentiful all over the clearing ; apparently quite naturalised.
* Capsicum minimum.	Table Island ; cultivated, and as an escape. Great Coco ; very plentiful and spreading far into the jungle.
20. * Scoparia dulcis.	Both islands ; common in the clearings.
* Rungia pectinata.	Table Island ; only in the clearing ; not plentiful and as it is not met with in Great Coco is probably here, as it often is, an introduced weed. But it need not always be so since the species is abundant on bare rocky promontories at the south end of Rutland Island where introduction by human agency is not to be thought of.
[Anisomeles ovata.	Great Coco ; this species is not present on Table Island apparently, and on Great Coco it was only found on the isthmus connecting the north-eastern peninsula—where the clearing is—with the main island. But the species does not occur *in* the clearing, and it is remarkably abundant where it occurs. Moreover it is exceedingly abundant in Diamond Island, off the Arracan Coast, which is another section of the same island chain ; the writer is therefore inclined to believe that the species does not owe its introduction to human agency but that it may be classed among the remanent species.]
[Boerhaavia repens.	In all three islands, common on rocky promontories and bare isolated rocks though a frequent weed of cultivation this owes its presence here, not to human influence, but to the agency of

	the sea or to that of littoral birds, such as the Bitterns and Terns that frequent the reefs and rocks, its sticky fruits probably attaching themselves to the feet of these.]
* Celosia cristata.	Table Island, a common escape.
25. * Achyranthes aspera.	Both islands, common in the clearings and undoubtedly introduced by man. But on Little Coco, the very distinct VAR. *porphyristachya* is abundant as a climber in the *Pandanus* sea-fence and is probably, like the same variety in the Nicobars, Laccadives, etc., a plant introduced by the sea.
* Gomphrena globosa.	Table Island, an abundant escape.
*Euphorbia pilulifera.	Table Island, a weed in the clearing, still rare.
* Musa sapientum.	There is a Plantain-garden attached to the lighthouse on Table Island. No Plantains are left on Great Coco, doubtless owing to the cattle. These animals eat not only coco-nut leaves but also the leaves of *Pandanus odoratissimus*, so that one is surprised to find that they have left anything in the garden at all. Except for the cattle (and perhaps the pigs, which might grout up the stocks) there is no reason why the Plantain should not thrive if left to itself. In Narcondam there is a grove of Plantains, introduced (by Col. Tytler ?), in excellent health.
* Cocos nucifera.	Common in all three islands but deserving neither to be deemed indigenous nor to be considered a species introduced by the sea. The question whether its presence is due to some old attempt at settlement or to the shipwreck of some coco-nut laden craft is discussed more fully below.
30. * Kyllinga brevifolia.	Both islands, only in the clearings.
* Fimbristylis diphylla.	Both islands, only in the clearings.

* Panicum ciliare.	Great Coco; near south end of island beside some shelter huts used by coco-nut collectors.
Panicum colonum.	Both islands, in the clearings and also at south end of Great Coco near the shelter huts.
* Panicum Helopus.	Table Island, in the clearing.
35. * Eleusine indica.	Table Island, clearing, common; Great Coco, rare in the clearing, also a few tufts among droppings of cattle on a bare hill at south-west corner of the island.
* Eleusine ægyptiaca.	Table Island; lighthouse clearing, still rare. [All the *Cyperaceæ* and *Gramineæ* may have been introduced by birds.]

Of the above, nineteen are species which are, or may be, cultivated for economic or æsthetic reasons—the economic plants being *Hibiscus Sabdariffa* (the Rozelle), *Hibiscus Abelmoschus* (the Musk-mallow), *Moringa pterygosperma* (the Horse-Radish tree), *Phaseolus* sp., *Tamarindus indica* (the Tamarind), *Carica Papaya* (the Papaw), *Ipomœa Batatas* (the Sweet- Potato), *Solanum Melongena* (the Bringal), *Capsicum minimum* (the Bird's-Eye Chillee), *Musa sapientum* (the Plantain), *Cocos nucifera* (the Coco-nut), *Panicum ciliare*, *colonum* and *Helopus* (three wild fodder-millets). Ten of these have undoubtedly been intentionally introduced—one (the Tamarind) certainly has not, and the three fodder grasses may have come as weeds, or equally probably, may have been introduced by grain-eating birds. The æsthetic plants are *Nymphœa rubra*, *Crotalaria sericea*, *Ipomœa coccinea*, *Celosia cristata*, and *Gomphrena globosa*. *Crotalaria sericea* may have been involuntarily introduced, the others almost certainly have been brought intentionally. The other seventeen are, or may be, weeds, but there is every probability that five of them, *Urena lobata*, *Vernonia cinerea*, *Adenostemma visocosum*, *Anisomeles ovata*, and *Boerhaavia repens* do not owe their presence here to human agency.

Of the introduced economic species three are evidently unfitted to survive under the conditions to which, when abandoned, they are exposed. The Rozelle succumbs to climatic influences, the Sweet-Potato and the Plantain are destroyed by animals. On the other hand the propagation of two of these species—the Papaya and the Bird's-Eye Chillee—is remarkable both for its extent and rapidity, and for the fact that the flavour and pungency of the fruit of these species remains undiminished.

The Coco-nut tree deserves to be specially noticed. It is not known where *Cocos nucifera* is "indigenous" and the suggestion that it is "really wild" on the Coco Islands and along the north-western coast of North Andaman, made by the late Mr. Kurz, (*Forest Flora of British Burma* ii, 540), though true enough so far as the Coco Islands are concerned, is denied, as regards North Andaman, by those officers at Port Blair who have had opportunities of investigating the shores of the group. Mr. Kurz did not himself visit either the Coco group or North Andaman, and unfortunately he does not give any authority for the latter part of his statement. But, granting its correctness, the fact remains that about Port Blair the tree only occurs as a recent introduction and it is not met with elsewhere either in South on Middle Andaman, except as a few young trees that have, on Rutland Island, the Sentinels, etc., been deliberately planted. More recently the writer has been told of a bay in one of the islands of the "Archipelago," near Port Blair, which is lined with Coco-nut trees, the result of the wreck of a particular craft that was lost on her way from the Nicobars to a Burmese port; this statement the writer has not yet been able personally to verify. In Narcondam there are Coco-nut trees in no fewer than three places, and as there is absolutely nothing to disturb them there, they are spreading rapidly. In Barren Island also there is one bay where a considerable number of Coco-nut trees grow and where also the species is rapidly spreading. But in both these islands the introduction has been deliberate and quite recent; this in Narcondam is particularly evident from the fact that the oldest trees occur along with a grove of Plantains, though it is equally apparent that the spread of the species to one, and probably to both, of the two other bays where it occurs, has been unassisted by man and is due to fallen nuts having been drifted round from the first planted trees. It is, however, very remarkable that *Cocos nucifera* should be so abundant in the Coco group and be absent from, or very rare in, the Andamans proper, including Little Andaman, and that the species should again occur in such abundance in the Nicobars. The direction of the ocean currents has been suggested as possibly explaining the fact, but with very unsatisfactory results, because, whatever be the theoretical direction assumed for these currents in order to explain the distribution of *Cocos nucifera,* it must fail to coincide with the direction postulated to explain the distribution of *Casuarina equisetifolia,* a tree which is extremely common in the Nicobars and is so plentiful in Little Andaman, where there are no Coco-nuts, that the English equivalent for the Andamanese name of the island is "Casuarina-sand," the name taking its origin from the great prevalence of this species on all its beaches. But though there are no Coco-nut trees in the Andaman group proper, there is one place where *Casuarina equisetifolia* occurs. This is a small bay, Casuarina Bay, on the west coast of North Andaman, on the beach of which the species is plentiful. In the Coco group, where there are Coco-nut trees, there is no *Casuarina equisetifolia* though it occurs again in Arracan and Chittagong where there are no Coco-nuts. As a matter of fact there is a steady current northward along the west coast of the Andamans for a considerable period of the year and it is difficult to understand why both *Cocos* and *Casuarina* do not occur plentifully along the whole west coast of the Andaman chain. The writer's examination of the ocean-drifts of the Coco group during his two visits did not throw much light on the subject. Wreckage in considerable quantity is to be found along the whole of the coasts, in most cases, however, belonging to wrecks that have occurred on the spot; the disposition of the fragments therefore only throws light on the "set" of local currents. Among the exceptions to this were a dressed teak-log on the east side of Great Coco, a padouk-log on the east side of Jerry Island, a quantity of Burmese sea-fishing-gear on the eyot between Great Coco and Jerry, fragments of two different Andamanese canoes on the east coast of Great Coco, a clump with roots of a very large Bamboo (not improbably *Bambusa gigantea*) on the west side of Great Coco, part of a third Andamanese canoe on the east side of the Little Coco, and a fruit, with part of stalk, of *Nipa fruticans* at the south end of Little Coco. Except the Andamanese canoes the whole of these objects indicated a "set" of ocean-current from Burma, for though *Nipa fruticans* which, strangely, appears to be absent from the Cocos, is both a Burmese and an Andamans species, this particular fruit had its stalk cut cleanly off by some sharp implement, and if it came from the Andamans it must therefore have floated from the neighbourhood of the settlement at Port Blair, a sufficiently improbable circumstance, as the examination of a map of the Andaman sea will show. Now if the set of the currents is such as to bring "drift" from Burma, and if these currents have brought the Coco-nut tree originally to the islands, we must explain how it happens that the islands of the "Archipelago" near port Blair, on the shores of which an undoubtedly Burmese "drift", in the shape of teak-logs, etc., is very plentiful, do not have Coco-nut trees on all their coasts. It has been suggested that the ocean-currents *have* thrown up Coco-nuts on the shores of the Andamans as well as on those of the Cocos, but that owing to the presence of the aboriginal inhabitants, always on the outlook for what they may pick up on the shore, the establishment of the species in the larger group has been impossible because any nut thrown up is found by them and immediately eaten or destroyed. This suggestion the writer owes to Mr. M. V. Portman of

Port Blair; it remains nevertheless difficult to understand why not a single Coco-nut should have escaped the notice of the Andamanese—who after all are not a numerous race—while, as it happens, we have Mr. Kurz's positive statement that in certain parts of North Andaman the species does occur.

It seems to the writer that for this particular group of islands, although the spread of the Coco-nuts *within* the group is undoubtedly due to the agency of the sea, the ocean-current theory does not explain the presence of the species, and that the original introduction has more probably been due to human interference. The question remains whether this was voluntary or involuntary. It may have been the result of an attempt at settlement in the island. The most recent attempt, which dates from 1878, is not the only one on record. An earlier attempt, as unsuccessful as the last, was made in 1849. But it does not follow, though these are the only attempts known, that they are the only ones which have been made. Both were made entirely on account of the Coco-nut being present in the islands, as perhaps other attempts before them may have been, for it appears that the name Coco Islands, implying the establishment there of *Coco nucifera* and the knowledge of that fact by navigators, dates from some of the very earliest European visits to Eastern seas. But it is not impossible that a yet earlier attempt to settle here may have been made and that the introduction of the Coco-nut may have been one of its results. It is easy to understand that these islands should have been chosen in preference to the more inviting-looking Andaman group owing to the character for ferocity which, for some curious reason, was attributed to the inhabitants of the Andamans by early navigators, and it is as easy to understand that the adverse natural conditions which prevail, and which have caused the failure of all recent attempts at settlement, must soon have led to the abandonment of the earliest attempt. The writer feels inclined to think that this may be the true explanation of the presence of *Coco nucifera* in the Cocos Islands. But it may quite as readily have been due to involuntary introduction by ship-wreck; for while disinclined to accept the suggestion that there are no Coco-nut trees in the Andamans because the Andamanese have eaten all the stranded Coco-nuts, when it is applied to nuts thrown up by ocean-currents, the writer thinks this explanation may well enough account for the presence of Coco-nut trees in the Cocos while they are absent from the main islands, if introduction by reason of ship-wreck is postulated. In the Cocos there are no inhabitants, while in the main islands there are; and though it is scarcely reasonable to suppose that the Andamanese would detect every nut that is cast up on the beach, there is little doubt that they would soon become aware of the wreck of a Coco-nut craft and, becoming aware of it, there is as little doubt that they would soon consume every Coco-nut the vessel contained.

Now that the Coco-nut tree is established in the islands, it germinates profusely. Even towards the centre of the island on flat or muddy tracts one meets with groves, containing from a score to several hundreds of trees, that have originated from nuts which have been floated inland by unusually high tides and left stranded far from the coast. The stems of these inland examples are abnormally tall, shooting up till the leafy head rises above the surrounding jungle; as far as can be seen, they do not flower till this happens. Once they have flowered and fruited the fallen nuts multiply the species fifty-fold. The nut appears to have but few enemies, and though a good many may be seen with a hole drilled through the husk and with the kernel scooped out, (apparently both crabs and rats are able to effect this,) the number thus destroyed forms quite an inappreciable proportion of the whole. The tree does not, however, invade the ridges, the soil is doubtless, as it is in South Andaman, too poor to suit it; while in trees growing along the bays on the west side of Great Coco the contents of the nut are distinctly less and their quality is appreciably poorer than in trees at the head of the bays on the opposite side; these in turn produce nuts that do not bear comparison with the magnificent examples grown in the Nicobars.

In the subjoined table the distribution of the "civilized" species is given; in those cases where the species is believed to be truly indigenous in a particular area the distribution mark indicating the area in question is enclosed within ( ) brackets. From this table we learn that 28 of these species, or 80 per cent. of the whole, are cosmopolitan in the tropics, and that, with the exception of one weed and two cultivated species, which do not occur in the Orient, they are sub-tropical as well as tropical species. The original home of about one-half of the species is known with some degree of certainty and it is interesting to note that 7, or 20 per cent. of the class, are originally natives of the New World, introduced in consequence of human intercourse into, and now established in, the Eastern Hemisphere as well. Ten of them are known to be natives of South-Eastern Asia; only six of these have spread beyond that area.

TABLE XII. *Distribution of* " Civilized " species *present in the Coco Group.*

Cultivated species.	Weeds.	SPECIES.	Africa.	Orient.	S. E. Asia.	Australia.	Polynesia.	America.
1	—	Nymphæa rubra	×	×	×	—	—	—
—	1	Sida carpinifolia	×	×	×	×	×	×
—	1	[Urena lobata]	×	—	×	×	×	×
1	—	Hibiscus Sabdariffa	×	×	(×)	×	×	×
1	—	Hibiscus Abelmoschus	×	×	(×)	×	×	×
1	—	Moringa pterygosperma	×	×	(×)	×	×	×
1	—	Crotalaria sericea	—	—	(×)	—	—	—
—	1	Desmodium triflorum	×	×	×	×	×	×
—	1	Alysicarpus vaginalis	×	×	(×)	×	×	×
1	—	Phaseolus sp.	?	?	×	?	?	?
1	—	Tamarindus indica	(×)	×	×	×	×	×
1	—	Carica Papaya	×	×	×	×	×	(×)
—	1	Vernonia cinerea	×	×	×	×	×	×
—	1	Adenostemma viscosum	×	×	×	×	×	×
—	1	Ageratum conyzoides	×	×	×	×	×	(×)
1	—	Ipomœa coccinea	×	×	×	×	×	(×)
1	—	Ipomœa Batatas	×	×	×	×	×	(×)
1	—	Solanum Melongena	×	×	(×)	×	×	×
1	—	Capsicum minimum	—	—	(×)	—	—	—
—	1	Scoparia dulcis	×	×	×	×	×	(×)
—	1	Rungia pectinata	—	—	(×)	—	—	—
—	1	[Anisomeles ovata]	—	—	(×)	—	—	—
—	1	[Boerhaavia repens]	×	×	×	×	×	—
1	—	Celosia cristata	×	×	×	—	—	×
—	1	Achyranthes aspera	×	×	×	×	×	×
1	—	Gomphrena globosa	×	×	×	×	×	(×)
—	1	Euphorbia pilulifera	×	×	×	×	×	×
1	—	Musa sapientum	×	—	(×)	×	×	×
1	—	Cocos nucifera	×	—	×	×	×	(×)
—	1	Kyllinga brevifolia	×	×	×	×	×	×
—	1	Fimbristylis diphylla	×	×	×	×	×	×
1	—	[Panicum colonum]	×	×	×	×	×	×
—	1	Panicum ciliare	×	×	×	×	×	×
1	—	[Panicum Helopus]	×	×	×	×	—	—
—	1	Eleusine indica	×	×	×	×	×	×
—	1	Eleusine ægyptiaca	×	×	×	×	×	×

The only *Cryptogam* that belongs to this class is the incompletely known *Fungus* the mycelium of which has proved so destructive to the tea-crop at Port Blair. From what has been said in the account of this species it will be seen that the species, whatever it may be, is certainly indigenous in, or at any rate has not been introduced by human agency into, the Andaman group.

We have now to consider the "sylvestrian", or truly wild, "migrant" species. These may be conveniently subdivided into "coast" and "inland" species—the former a group the members of which may, and here in most instances probably do, owe their presence to introduction by means of ocean-currents. But just as we have seen that some of the weeds may be claimed as indigenous, or at all events as introduced by other than human agency, so here we find that these classes pass insensibly into each other and that species which may be introduced by the sea, such as *Entada scandens, Gloriosa superba, Boerhaavia repens, Cocos nucifera*, etc., may quite as reasonably owe their presence to a previous land-connection, to wind, to birds, or to involuntary or voluntary human agency. The more doubtful instances, however, will be found discussed in detail below. This group of species, however, as a whole, is characterised by a general distribution which is directly affected by the physiographical features of, and the currents that prevail in, the surrounding seas, and is only indirectly, if at all, influenced by the configuration of the adjacent land.

The "coast" species have to be further subdivided in "marine" and "littoral" species, and the former group, as comprising the plants for which the influence of ocean-currents is most evident, will be considered first. Only one *Phanerogam* belongs to this class; this species, *Cymodocea ciliata*, is however almost the most plentiful, the only other common species being *Sargassum ilicifolium;* all the others are very inconspicuous, being few in number, small in size, and scantily represented.

The following table gives at once a list of, and indicates the marine distribution for, these species; for six of them, as the general list shews, this is, as regards the *Algæ*, only approximate.

TABLE XIII. *Distribution of the* "Marine" species *present in the Coco Group.*

SPECIES.	Atlantic.	Indian Ocean.	Pacific.	SPECIES.	Atlantic.	Indian Ocean.	Pacific.
Cymodocea ciliata ...	—	×	—	Gelidium corneum ...	×	×	×
Sargassum ilicifolium ...	×	×	×	Caulerpa clavifera ...	×	×	×
Turbinaria ornata ...	—	×	—	Caulerpa plumaris ...	—	×	—
Padina pavonia ...	×	×	×	Valonia fastigiata ...	—	×	×
Dictyota dichotoma ...	×	×	×	Valonia confervoides ...	—	×	—
Lithothamnion polymorphum ...	×	×	—	Halimeda Opuntia ...	×	×	×
Acanthophora Thierii ...	×	×	×	Siphonocladus ? filiformis ...	—	×	—
Jania tenella ...	—	×	—	Vaucheria sp. ...	—	×	—
Gracilaria crassa ...	—	×	—	Calothrix pulvinata ...	×	×	×

Nearly one-half of the species are cosmopolitan in tropical seas; probably some of the six of which the distribution is not accurately ascertained are also cosmopolitan. One species appears to extend only to the Pacific from the Indian Ocean, another only to the Atlantic from the Indian Ocean. The *Cymodocea*, though present in Africa, appears not to be recorded from the Mascarene Islands, and *Sargassum ilicifolium* though occurring in Malayan waters, has not yet been found on the coasts of Northern Australia. One species, *Dictyota dichotoma*, is rather more frequent in sub-tropical than in tropical seas and is cosmopolitan in both the northern and the southern hemispheres.

The next group of species to be considered—the "littoral"—includes many plants for which the evidence of introduction by the sea is almost as palpable as in the case of the "marine" species themselves. They germinate on the beaches, and grow only near the sea, preferably in muddy creeks or on the sand or shingle; their fruits and seeds are found in every "drift" and the species themselves occur on every Indian or Malayan coast. Such are the true mangroves and the species like *Avicennia*, *Ægiceras*, *Carapa*, that are constantly associated with the mangrove-vegetation; the sand-binding species like *Ipomœa biloba*, *Euphorbia Atoto*, *Sesuvium Portulacastrum*, *Vigna lutea*, *Thuarea sarmentosa*; the tropical sea-fence of *Pandanus odoratissimus*, *Desmodium umbellatum*, *Sophora tomentosa*, *Tournefortia argentea*, *Clerodendron inerme*, *Vitex Negundo*, with its concomitant climbing vegetation, *Canavalia obtusifolia*, *Ipomœa digitata*, *Argyreia tiliæfolia*; the outer beach-forest of *Terminalia Catappa*, *Hernandia peltata*, *Erythrina indica*, *Stephegyne diversifolia*; the inner beach forest of *Cycas*, *Mimusops* and *Pisonia*; and even the species of the mud-flats within, like *Leea sambucina*, *Hibiscus tiliaceus*, *Cynometra ramiflora*, *Flagellaria indica* and many more. The seeds of all these have been observed by the writer in the "drifts" of these islands and many of them have been noted, either in the Andamans and Nicobars, or in Narcondam, germinating on the beach. There are others, however, that are more doubtful, and, though the whole of the species for which this mode of introduction is conceivable are given below, the species for which any doubt is possible are enclosed in brackets and the more equivocal of these are discussed at the end of the list.*

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* Since this paper was written and while these pages have been passing through the press two papers have appeared that deal with this section of the flora of the Malayan countries much more fully than the scope of the present paper permits. To these papers, *viz*:—*Schimper: Die Indo-Malayische Strandflora* (Jena: Gustav Fischer, 1891) and *Karsten: Ueber die Mangrove-Vegetation in Malayischen Archipel; Bibliotheca Botanica*, Heft 22 (Cassel: Theodor Fischer, 1891) neither of which had appeared when the writer's remarks were written and which he greatly regrets having been unable to refer to in the text, the writer would refer those who are interested in the subject of mangrove and coast plants and the influence of ocean-currents and their distribution.

TABLE XIV. *Distribution of* "littoral" species *present in the Coco Group.*

SPECIES.		Atlantic.		Indian Ocean.				Malay seas.		Pacific.	
		Eastern America.	Western Africa.	Eastern Africa.	Mascarene Islands.	Indian coasts.	Burma, Malacca, Andaman, Java.	Malay Islands.	Northern Australia.	Polynesia.	Western America.
Calophyllum inophyllum ..	...	—	—	—	×	×	×	×	×	×	—
Hibiscus tiliaceus ...	...	×	×	×	×	×	×	×	×	×	×
Thespesia populnea ...	...	—	×	×	×	×	×	×	×	×	—
[Sterculia rubiginosa, *var.*]	...	—	—	—	—	—	×	—	—	—	—
5. Heritiera littoralis ...	...	—	—	×	×	×	×	×	×	×	—
Carapa moluccensis ...	...	—	—	×	×	×	×	×	×	×	—
Colubrina asiatica ...	...	—	×	×	×	×	×	×	×	×	—
Leea sambucina ...	...	—	×	×	×	×	×	×	×	×	—
[Leea hirta]	..	—	—	—	—	×	—	—	—	—	—
10. [Dodonæa viscosa ...	...	×	×	×	×	×	×	×	×	×	×
[Dracontomelum mangiferum]	...	—	—	—	—	—	×	×	—	×	—
Desmodium umbellatum ...	...	—	—	×	×	×	×	×	×	×	—
[Desmodium triquetrum]	...	—	—	—	—	—	×	×	—	—	—
[Desmodium polycarpum]	...	—	—	×	×	×	×	×	×	×	—
15. Erythrina indica ...	...	—	—	—	×	×	×	×	×	×	—
Mucuna gigantea ...	...	—	—	—	×	×	×	×	×	×	—
Canavalia obtusifolia ...	...	×	×	×	×	×	×	×	×	×	×
Vigna lutea	...	×	×	×	×	×	×	×	×	×	×
Derris sinuata ...	...	—	—	—	—	×	×	×	—	—	—
20. Derris uliginosa ...	...	—	—	×	×	×	×	×	×	×	—
Pongamia glabra ...	...	—	—	—	×	×	×	×	×	×	—
Cæsalpinia Bonducella ...	...	×	×	×	×	×	×	×	×	×	×
Cæsalpinia Nuga ...	...	—	—	—	—	×	×	×	×	×	—
Sophora tomentosa ...	...	×	×	×	×	×	×	×	×	×	—
25. Cynometra ramiflora ...	...	—	—	—	—	×	×	×	×	—	—
Entada scandens ...	...	×	×	×	×	×	×	×	×	×	—
Rhizophora mucronata ...	...	—	—	×	×	×	×	×	×	×	—
Rhizophora conjugata ...	...	—	—	—	—	×	×	×	—	—	—
Ceriops Candolleana ...	...	—	—	—	—	—	×	×	×	—	—
30. Ceriops Roxburghiana ...	...	—	—	—	—	×	×	×	—	—	—
Bruguiera gymnorhiza ...	...	—	—	?	×	×	×	×	×	×	—
Terminalia Catappa ...	...	—	—	—	—	—	×	×	—	—	—
Lumnitzera racemosa ...	...	—	—	×	×	×	×	×	×	×	—
Gyrocarpus Jacquinii ...	...	×	×	—	—	×	×	×	×	×	×
35. Barringtonia speciosa ...	..	—	—	—	×	×	×	×	×	×	—
Barringtonia racemosa ...	...	—	—	×	×	×	×	×	—	×	—
Pemphis acidula	...	—	—	×	×	×	×	×	×	×	—
Sesuvium Portulacastrum	...	×	×	×	×	×	×	×	×	×	×
Stephegyne diversifolia ...	...	—	—	—	—	—	×	×	—	—	—
40. Guettarda speciosa ...	..	—	—	×	×	×	×	×	×	×	—
Ixora brunnescens ...	...	—	—	—	—	—	×	—	—	—	—
Morinda bracteata ...	.	—	—	—	—	×	×	×	—	—	—
Adenostemma viscosum ...	...	×	×	×	×	×	×	×	×	×	×
Pluchea indica ...	...	—	—	—	—	—	×	×	—	—	—
45. Wedelia scandens ..	...	—	—	×	×	×	×	×	×	×	—
Scævola Kœnigii ...	...	—	—	—	—	×	×	×	×	×	—

SPECIES.	Atlantic.		Indian Ocean.				Malay seas.		Pacific.	
	Eastern America.	Western Africa.	Eastern Africa.	Mascarene Islands.	Indian coasts.	Burma, Malacca, Andaman, Java	Malay Islands.	Northern Australia.	Polynesia.	Western America.
[Ardisia humilis]	—	—	—	—	×	×	×	—	—	—
Aegiceras majus	—	—	—	—	×	×	×	×	×	—
Mimusops littoralis	—	—	—	—	—	×	—	—	—	—
50. Cerbera Odollam	—	—	—	—	×	×	×	×	×	—
Ochrosia borbonica	—	—	—	×	×	×	×	—	—	—
Tabernæmontana crispa	—	—	—	—	—	×	—	—	—	—
Sarcolobus globosus	—	—	—	—	×	×	×	—	—	—
Cordia subcordata	—	—	×	×	[×]	×	×	×	×	—
55. Tournefortia argentea	—	—	×	×	×	×	×	×	×	—
Argyreia tiliæfolia	—	—	—	—	×	×	×	—	—	—
Ipomæa grandiflora	—	—	×	×	×	×	×	×	×	—
Ipomæa digitata	×	×	×	×	×	×	×	×	×	×
Ipomæa denticulata	—	—	—	×	×	×	×	×	×	—
60. Ipomæa biloba	×	×	×	×	[×]	×	×	×	×	×
Convolvulus parviflorus	—	—	—	—	×	×	×	×	—	—
Physalis minima	×	×	×	×	×	×	×	×	×	×
[Oroxylum indicum]	—	—	—	—	×	×	×	—	—	—
Eranthemum succifolium	—	—	—	—	—	×	?	—	—	—
65. [Peristrophe acuminata]	—	—	—	—	—	×	×	—	—	—
[Lippia nodiflora]	×	×	×	×	×	×	×	×	×	×
Premna integrifolia	—	—	—	—	×	×	×	×	?	—
Premna sp.	—	—	—	—	—	×	?	?	—	—
Vitex Negundo	—	—	×	×	×	×	×	—	—	—
70. [Vitex pubescens]	—	—	—	—	×	×	×	—	—	—
[Vitex Wimberleyi]	—	—	—	—	—	×	—	—	—	—
Clerodendron inerme	—	—	—	—	×	×	×	×	×	—
Avicennia officinalis	×	×	×	×	×	×	×	×	—	×
Boerhaavia repens	—	×	×	×	×	×	×	×	×	—
75. Pisonia aculeata	×	×	×	×	×	×	×	×	—	—
[Pisonia excelsa]	—	—	—	—	—	×	×	—	—	—
Achyranthes porphyristachya	—	—	—	—	×	×	×	—	—	—
Hernandia peltata	—	—	—	×	×	×	×	×	×	—
Cassytha filiformis	×	×	×	×	×	×	×	×	×	×
80. Euphorbia Atoto	—	—	—	—	×	×	×	×	×	—
Macaranga Tanarius	—	—	—	—	—	×	×	—	—	—
Cycas Rumphii	—	—	—	—	×	×	×	×	—	—
Crinum asiaticum	—	—	—	—	×	×	×	×	×	—
Tacca pinnatifida	—	×	×	×	×	×	×	×	×	—
85. Dracæna angustifolia	—	—	—	—	—	×	×	×	—	—
[Gloriosa superba]	—	—	—	—	×	×	×	—	—	—
Flagellaria indica	—	—	×	×	×	×	×	×	—	—
Caryota sobolifera	—	—	—	—	—	×	×	—	—	—
[Cocos nucifera]	×	×	×	×	×	×	×	×	×	×
90. Pandanus odoratissimus	—	—	—	×	×	×	×	×	—	—
Cyperus pennatus	—	—	—	×	×	×	×	×	×	—
Fimbristylis ferruginea	×	×	×	×	×	×	×	×	×	×
Thuarea sarmentosa	—	—	—	×	×	×	×	×	×	—
Ischæmum muticum	—	—	—	—	—	×	×	×	×	—

This list includes 94 species for which sea-introduction is conceivable, and for the presence of most of the species it contains this mode of introduction is almost certainly responsible. The list might even be made more extensive than it is, for if *Sterculia rubiginosa*, which is a purely "littoral" species here as it is elsewhere throughout the Andaman and Nicobar groups—to which area the variety found in the Coco Islands is strictly confined,—be sea-introduced, there is no reason why some of the other species of *Sterculia* should not be added. As a matter of fact the writer has collected specimens of species of *Sterculia* in Narcondam and in Batti Malv, the first island a locality where certainly, the second one where probably, every species present has been somehow or other introduced. But no *Sterculia* seeds were recognised in the "drifts" and therefore the whole of the species have been left out except this purely 'littoral' one, while even it has been omitted from consideration in the analysis of the table which follows. Again, *Leea hirta* might well be sea-introduced if *Leea sambucina* is; their fruits are very similar and *Leea* fruits are common in the "drifts." All the fruits found, however, were precisely the same and seemed to be undoubtedly those of *Leea sambucina*, which is a very common species in the mud flats that skirt the mangrove-swamps, where it occurs as a considerable shrub or small tree with stilted roots that imitate the style and appearance of those of the mangroves. Both species, however, may have been introduced by fruit-eating birds; only one therefore, owing to its habitat, is taken as an example of this mode of introduction, the other being relegated to the list of species that are bird-introduced. Another species to which the same remarks apply is *Ardisia humilis*, which is a purely beach-forest species and, as such, is equally common here, on Narcondam, in the Andamans, and in the Nicobars; perhaps it is, on the whole, more likely to have been introduced owing to birds having eaten its purple-berried fruit. *Allophylus Cobbe*, which is almost certainly bird-introduced, may be quoted in support of this, for though it also occurs in the interior it is a common tree in the *Pandanus* fence and in the beach-forest. *Dracontomelum mangiferum* might be a sea-introduced species, for Mr. Hemsley records a *Dracontomelum ?* fruit from the New Guinea "drift", with empty seed-cells however (*Challenger Reports; Botany*, vol. i, part 3, p. 290). And if *Dracontomelum* be included so might *Spondias* and *Canarium*, for though birds and bats eat the pulpy fruits of these species they cannot swallow the stone and, as in the case of *Terminalia Catappa*, can hardly do more than assist in dispersing them locally. *Desmodium triquetrum* and *Desmodium polycarpum* are both very common on the rocky parts of the coast just above the spray-line and their fruits therefore are extremely common in the "drifts." But it is not at all clear that they must therefore be put down in the list of sea-introduced species; they are well-known as weeds of cultivation elsewhere, being diffused because of the readiness with which the indehiscent segments of their fruits attach themselves to the clothes of man and to the fur of his domestic animals. Here they are undoubtedly not weeds introduced by man, but it may well be that they have been introduced by birds, owing to fragments of their pods having attached themselves to their feathers. Another species to which the same remarks apply is *Adenostemma viscosum*, though this is more probably sea-introduced than the other; still another is *Boerhaavia repens;* perhaps all four are distributed at one time by the sea, at another by birds. *Lippia nodiflora* may also be a bird-introduced species; its seeds may have been brought in the pellets of mud that become attached to the feet, and to the feathers at the base of the bill of wading- and swimming-birds. *Achyranthes porphyristachya* which, from its situation in these islands, cannot be a weed introduced by man, and which is a common sea-shore species in the Nicobars and in the Laccadives also, may perhaps be bird-introduced like the *Desmodia*. If, as is suggested, now one agency, now another is responsible for the dispersal of these species, it is easy to understand why those species should all be "littoral" in these islands and yet occur as inland species in other localities. *Mucuna gigantea* will be readily admitted as an unequivocal example of this mode of distribution, as will *Derris sinuata*, for both occur in the beach-forest more commonly than they do on the ridges; so too, will the other *Leguminosæ* of the list except perhaps *Entada scandens*. And yet *Entada scandens* must be sometimes an introduced species, for it is one of the plants that occur on Narcondam, an island for which it seems impossible to postulate any previous land-connection; the writer moreover had the good fortune to find one of its enormous seeds germinating along with those of *Mucuna*, etc., on the sandy islet between Great Coco and Jerry.

Physalis minima is a species that at first suggests bird-introduction rather than sea-introduction, and its wide inland dispersal undoubtedly is largely owing to its fruits being eaten and to the subsequent voiding of its hard discoid seeds. But here it is only found close to the sea just above the spray-line and its fuits were found in the "drifts" here and there, the light bladder-like calyx amply accounting for their flotation; the pulp of the fruit probably protects the seeds, if such protection be necessary, from the action of the salt water. Among the *Convolvulaceæ*, for which this means of dispersal is not at all uncommon, the only species now included that calls for remark is *Convolvulus parviflorus*. It is, however, one of the commonest of the sea-face creepers along the west coast of Great Coco, and is equally common on Narcondam, Barren

Island, Rutland Island and Batti Malv, and is included in the list without any feeling of doubt in the mind of the writer. On the other hand, indeed, it is with some diffidence that another species, *Ipomœa Turpethum*, is omitted. All three species of *Vitex* given are "littoral," but while there seems no doubt that *Vitex Negundo* is sea-introduced, it is on the whole more probable that the others are introductions by fruit-eating birds. *Macaranga Tanarius* is also a species that from its habitat the writer has no hesitation in considering a sea-introduced species; another that he would have wished to include is *Blachia andamanica* which occurs on the coast with *Desmodium umbellatum, Pluchea indica* and other unequivocally littoral species. Moreover there are several of these shrubby and arboreous *Euphorbiaceæ* on Narcondam; their presence there indicates that some mode of introduction for species of this order must be possible. In the absence, however, of direct experiment with their seeds the others have been left to swell, probably unduly, the list of "remanent" species. *Tacca pinnatifida*, which is an inland as well as a coast species, may be bird-introduced, for its seeds are embedded in a sweet pulp. But though a species of ant is very fond of this fruit and scoops out all the ripe pulp, leaving the seeds bare but uninjured in an otherwise empty bag, no bird, so far as the writer could see, appears to eat them. The two *Pisonias*, one a climber, the other a tree, are both "littoral" and so may well be sea-introduced, but as both have peculiar fruits with glutinous lines along their sides they may equally well be bird-introduced species. The sticky lines along the angles of the fruits of *Pisonia excelsa* in particular have all the tenacity of bird-lime. As this species occurs some way inland as well as along the coast there is little doubt that, even if sea-introduced, its further dispersal is assisted by ground-feeding birds or small mammals. The fruits of two species of *Dipterocarpus* were seen in the "drifts," but the writer has no hesitation, from what is known regarding the delicacy of the seeds in this order and the rapidity with which their power of germinating is lost, in excluding both from the list. From what has already been said regarding "civilized" species it will be seen that though *Cocos nucifera* is undoubtedly capable of being introduced by the sea, it is probably not to this agency that its presence in these islands is due. *Caryota sobolifera*, however, which is throughout the whole Andaman group a very common species, both on flat and on rising ground, and which is as common on Narcondam as in the Cocos, is probably a sea-introduced species.

Peristrophe acuminata is another species that affects only the localities in which *Desmodium polycarpum* and its companions are found and ought probably to be included among the littoral species; in the absence of further evidence, however, it is treated as only doubtfully sea-introduced. Another doubtful species is *Dodonæa viscosa*, a cosmopolitan species. Still another, equally doubtful, is *Gloriosa superba* which is exceedingly common in the coast zone on both the Coco Islands, and which the writer has collected, in the coast zone also and only there, in South Andaman, in Rutland Island, in Batti Malv, in Car Nicobar, in Narcondam, and in Barren Island, and which Dr. Alcock has collected, near the sea, in the Laccadives. On the whole therefore we might feel justified in considering it a sea-introduced species. But it is very abundant also throughout the whole of India; it extends from the Nilghiris and Central India to Rajputana, the Panjab, and the Gangetic plain, as well as to the Himalaya from Kamaon to Bhutan, and is common in Bengal, Assam and Burma. It cannot very easily be bird-introduced and one must therefore incline to the opinion that the agency responsible here is that of winds, a view which is favoured by the nature of its seeds. But even then it is not easy to suppose that winds could carry these as far as some of the islands mentioned and still that its distribution should be limited to South-Eastern Asia. *Oroxylum indicum* might possibly be sea-introduced, but on the whole has more probably been brought by wind. It need not be indigenous for it occurs in abundance in Narcondam. Though its fruits occur in the "drifts" they are always split open and it is unlikely that the seeds could remain attached to the fruit-segments during their transit from any of the neighbouring coasts.

Few of the cryptogams can be considered "littoral" and the statements that have been made of the possibility of *Fungi*, etc., being brought to ocean-islands attached to logs of wood or trunks of trees are not as a rule made by those who have seen and carefully examined ocean-drifts. Even *Polyporus sanguinale*, which apparently has a prediliction for dead or dying trunks of *Cocos nucifera*, being commoner there than in any other situation, was not found growing on any of the trunks that lie on the beaches exposed to the sun after having been soaked in salt water. The logs that are cast up on the beach and the roots that protrude from the sand at those points where denudation is going on, are scrubbed bare by the coral-sand and bleached white by the sun; they harbour no *Fungi* and seem preserved from decay by the treatment to which they have been subjected. There is, however, a striking exception in a "dry-rot" which attacks *Mimusops littoralis* trunks and some other timbers. In the case of the Bullet-wood it was seen both on Great and Little Coco; the same appearance was presented by the remains of a wooden vessel in Little Coco. The appearance and consistence of this "dry-rot" so closely resemble the results of charring that it was difficult to realize that the wood in question had not been subjected to fire. The effects of actual charring were, however, observed in the hollow trunk of a large *Mimusops* near the shelter huts at the south end of Great Coco; closer comparison shows that the product of the *Fungus* has a facies of its own unlike that of true charcoal. This difference is difficult to express in words, but is very recognisable when the two things are placed side by side. The phenomenon was not noticed in the case of *Erythrina*, *Heritiera*, *Stephegyne*, or other dead trees on the beach.

Excluding from consideration all the doubtful species enclosed in brackets we find that there are 80 unequivocally sea-introduced plants, or more than one-fourth of the phanerogamic species and over 22 per cent. of the entire flora. On consulting the distribution it is seen how greatly the coast flora is one characteristic of the Indian Ocean and of Malayan Seas, particularly the latter, since 76 species, or 97 per cent., occur on the shores of the Malay Islands, whereas only 66, or 83 per cent., occur on the Indian coasts of the Sea of Bengal. Moreover one of these, *Sarcolobus globosus*, might almost be omitted, its only Indian locality being the Sunderbuns, at the head of the Bay of Bengal. Another, *Ipomœa denticulata*, though extending up the eastern side of the Bay to the coast of Arracan, is, on the western side, confined to Ceylon. This indication of a tendency to extension eastward is borne out by the features of the further distribution of these species, for 60 species, or 76 per cent., extend south-eastward to the shores of northern Australia, while only 47, or 59 per cent., extend south-west to the Mascarene Islands; and 51 species, or 64 per cent., occur in one or other of the Polynesian groups, while only 36, or 46 per cent., reach continental East Africa. But, while this is the case, it is interesting to note that 21 species, or 24 per cent., occur on the African Atlantic coast, and 15 species, or 19 per cent., cross the Atlantic to the Eastern coasts of America, whereas only 13 species, or 16 per cent., extend across the Pacific from Polynesia to the Western American coasts. These features of the littoral flora are given more compactly in the subjoined table.

TABLE XV. *Extension of* "littoral" species *present in the* Coco Group.

Species extending westward to					Species present in the	Species extending eastward to			
America. (Atlantic Coasts.)	West Africa. (Atlantic Coasts.)	Eastern Africa.	Mascarene.	India and Ceylon.	COCO GROUP.	Malay Archipelago.	North Australia.	Polynesia.	America. (Pacific Coasts.)
15	21	36	47	66	80	76	60	51	13
19%	24%	46%	59%	83%	100%	97%	76%	64%	16%

An analysis of the table of distribution from the opposite point of view is given below; from it we learn that 11 species, or 14 per cent., are cosmopolitan on tropical sea-shores; that four more are nearly cosmopolitan, being present in both hemispheres; that only four, so far as is known, are limited to the coasts of these islands, the Andamans and the Nicobars; and that, excepting these four, every one of the species is found on the Malayan Coasts. So far then as the "littoral" species are concerned we must conclude that the flora of the Coco Group is decidedly Malayan.

TABLE XVI. *Analysis of distribution of* "Littoral" species.

Present on both Pacific and Atlantic coasts :—				19
Cosmopolitan on tropical sea-shores :—			11	
Almost ditto, (present in both hemispheres) :—			4	
Absent from Pacific American coasts only :—		2		
Absent from Pacific Polynesian coasts only		1		
Absent from Eastern African and Mascarene coasts only		1		
Absent from New World entirely :—			4	
Present on Atlantic and Indian Ocean (not on Pacific) coasts				1
Present on Pacific and Indian Ocean (not on Atlantic) coasts				33
Extending from Africa to Polynesia :—			15	
On all intervening shores :—		14		
Absent only from Northern Australia		1		
Extending from Mascarene islands to Polynesia :—			9	
Extending from India to Polynesia			8	
Extending from Coco Islands to Polynesia			1	
Confined to Indian Ocean and Malayan Seas				27
Western species :—			4	
Extending from Africa to Australia :—		2		
In both Africa and Mascarenes	1			
In Mascarenes, not in Africa	1			
Extending from Africa to Malaya only		2		
In Continental Africa, not in Mascarenes	1			
In Mascarenes, not in Africa	1			
Eastern species :—			6	
Extending from Australia to India		3		
Extending from Australia to the Coco Group		3		
Central species :—			17	
Extending from India to Malaya		8		
Extending from Coco Group to Malaya		5		
Extending from Coco Group to Nicobars only		4		
TOTAL number of "Littoral" species.				80

In discussing the inland "immigrant" species the first agency to be considered is that of winds. This influence must here be stronger than in many places, for though the south-west monsoon, which blows for half the year, sweeps only over a wide expanse of sea before it reaches the islands, there is a very distinct and tolerably powerful north-east monsoon which, during a considerable part of the remaining half-year, blows from the direction of the adjacent Burmese coast.

It is, however, easy to overrate the effect of this agency and however well adapted certain friuts, such as those of the two *Dipterocarpi*, *Terminalia bialata*, *Pterocarpus indicus*, *Sterculia companulata*, *Porana spectabilis*, *Illigera conyzadenia*, *Ventilago calyculata*, or seeds, such as those of *Sterculia alata*, *Gloriosa superba*, *Aristolochia tagala*, may at first sight appear to be for transmission by wind, it seems very doubtful on further consideration if any of those mentioned could possibly be carried so far as from the nearest mainland to these islands. In most of these cases the wings of the fruits or seeds can only, as in that of *Gyrocarpus*, assist in local dispersal. Regard must be paid, too, to the usual situation of the species, and in the case of *Orchids*, for example, the seeds of which are light, and well adapted for carriage in this way, it is doubtful if *Calanthe veratrifolia*, which is always found in densely shady places, could have been brought in this way. Similarly among the inland *Cryptogams*, for all of which except *Chara* this means of dispersal is doubtless possible, it seems more probable that *Acrostichum appendiculatum*, which affects the same localities as *Calanthe*, and *Ceratopteris thalictroides*, which undoubtedly is sometimes, if not always, bird-introduced, ought to be excluded from this list.

The table below gives the whole of the possibly "wind-introduced" species present in the group.

TABLE XVII. *Distribution of* Wind-introduced "inland" species *present in the Coco Group.*

SPECIES.	Africa.	S. E. Asia.			Australia.	Polynesia.	America.	Narcondam.	Barren Island.
		India.	Indo-China.	Malaya.					
Bombax insigne	—	×	×	×	—	—	—	?	—
Eriodendron anfractuosum ..	×	×	×	×	—	—	×	—	—
Dodonæa viscosa	×	×	×	×	×	×	×	—	×
[Vernonia cinerea]	×	×	×	×	×	×	×	—	—
5. Vernonia divergens	—	×	×	—	—	—	—	×	—
Bumea virens	—	×	×	—	—	—	—	×	—
[Strophanthus Wallichii]... ...	—	—	[×]	—	—	—	—	—	?

SPECIES.	Africa.	S. E. Asia.			Australia.	Polynesia.	America.	Narcondam.	Barren Island.
		India.	Indo-China.	Malaya.					
Anodendron paniculatum ...	—	×	×	×	—	—	—	×	—
Chonemorpha macrophylla ...	—	×	[×]	×	—	—	—	×	—
10. Hoya parasitica	—	—	×	×	—	—	—	×	×
Hoya diversifolia	—	—	×	×	—	—	—	×	×
Dischidia nummularia	—	—	×	×	×	—	—	×	—
Oroxylum indicum	—	×	×	×	—	—	—	×	×
Heterophragma adenophyllum ...	—	—	×	—	—	—	—	×	—
15. Aristolochia tagala	—	×	×	×	—	—	—	×	×
Dendrobium secundum	—	—	×	×	—	—	—	—	—
[Calanthe veratrifolia]	—	×	[×]	×	×	—	—	—	—
Dorites Wightii	—	×	×	—	—	—	—	—	—
Aërides multiflorum	—	×	×	—	—	—	—	—	—
20. Pholidota imbricata	—	×	×	×	—	—	—	—	×
Dioscorea glabra	—	×	×	×	—	—	—	×	×
Dioscorea pentaphylla	—	×	×	×	—	—	—	×	×
Gloriosa superba	—	×	×	×	—	—	—	×	×
[Ischæmum ciliare]	—	×	×	×	×	—	—	—	×
25. [Andropogon contortus]	×	×	×	×	×	×	×	—	×
Davallia solida	—	—	[×]	×	×	×	—	×	—
Adiantum lunulatum	×	×	×	×	×	×	×	—	—
Polypodium irioides	×	×	×	×	×	×	×	×	—
Polypodium adnascens	×	×	×	×	—	×	×	—	—
30. Polypodium quercifolium... ..	—	×	×	×	×	×	—	×	×
Vittaria elongata	×	×	×	×	×	×	—	×	—
Acrostichum scandens	—	×	×	×	×	×	—	×	×
[Acrostichum appendiculatum] ...	—	×	×	×	—	—	—	×	×
Lygodium flexuosum	×	×	×	×	×	—	—	×	—
35. Calymperes Dozyanum	—	[×]	[×]	×	—	×	—	?	—
Bryum coronatum	×	×	×	×	×	×	×	×	×
Collema nigrescens	×	×	×	×	×	×	×	×	—
Physcia obscura	×	×	×	×	×	×	×	—	—
Lentinus leucochrous	—	—	[×]	×	—	—	—	—	—
40. Lenzites deplanata	—	×	×	×	—	—	—	—	—
Lenzites subferruginea	—	×	×	×	—	—	—	—	—
Polyporus fulvus	—	—	[×]	×	—	—	—	—	—
Polyporus xanthopus	×	×	×	×	×	×	×	?	—
Polyporus sanguineus	×	×	×	×	×	×	×	?	—
45. Polyporus grammatocephalus ...	—	×	×	×	×	—	×	—	—
Polyporus australis	×	×	×	×	×	×	×	×	—
Hexagona pergamenea	—	[×]	[×]	—	—	—	—	—	—
Hexagona sericeo-hirsuta ...	—	—	[×]	—	—	—	×	—	—
Hexagona tenuis	×	—	[×]	—	—	—	—	—	—
50. Dedælea flabellum	—	×	[×]	—	—	—	—	—	—
Dedælea sanguinea	—	×	[×]	—	—	—	—	—	—
Dedælea quercina	×	×	×	×	×	×	×	?	—
Dedælea concentrica	×	×	×	×	×	×	×	×	—
Thelephora incrustans	×	×	×	×	×	×	×	×	×
55. Bovista lilacina	×	×	×	×	×	×	×	—	—
Hirneola polytricha	×	×	×	×	—	×	×	—	—
Daldinia vernicosa	—	×	[×]	—	—	—	×	—	—
Rhytisma sp.	—	—	[×]	—	—	—	—	×	×

It will be seen that the majority of the species in this table are actually present in one or other of the two volcanic islands of the Andaman Sea, Narcondam and Barren Island, and even in these cases where they are not present allied species are. There is a *Bombax* in Narcondam and though its specific identity or otherwise with the Andamans one cannot be here discussed, it is evident that any *Bombax* may be wind-introduced. And whatever agency explains the presence of *Bombax* will, *pari passu*, explain that of *Eriodendron*.

Not a single orchid was found on Narcondam though on Barren Island two were found—a species of *Dendrobium* on trees on the outer cone, and *Pholidota imbricata*, which occurs at the top of the inner cone within the crater-cup where the ground is kept moist by the condensation of escaping steam. Then the *Hoyas* are both present in great abundance on the exposed rocks and tall trees of both islands. The most doubtful species undoubtly are *Aristolochia tagala*, *Gloriosa superba*, and, especially, the two species of *Dioscorea*. Yet these must all be immigrant. The writer has collected *Aristolochia tagala* on Batti Malv, a small outlying uninhabited fragment of the Nicobar Group, on Barren Island, and on Narcondam. And even if it be claimed that on Batti Malv the species may be a remanent one on the other two islands it, like every other species, *must* be immigrant. The case of *Gloriosa superba* has already been discussed when dealing with the species introduced by the sea. The *Dioscoreas* are still more difficult to explain, but it hardly seems as if they could be bird-introduced, and it is almost as difficult to think that they have been introduced by the sea. They are never littoral, being even in these islands strictly confined to the higher dry ridges. Yet they are certainly not necessarily remanent, for the writer has collected not these only but a third species, *Dioscorea bulbifera*, or at all events a bulbiferous one, which is present along with these two in great quantity in Narcondam and especially in Barren Island. In both these islands the species must all be immigrant and from the physiographical history of Barren Island should there be, biologically speaking, extremely recently so. Though no *Strophanthus* occurs in Barren Island, an *Aganosma* is common there. The distribution of the *Cryptogams* of this class calls for little remark, the peculiarities displayed in this respect by the *Fungi* being probably altogether owing to this class being imperfectly known in most floras. The presence, for instance, of two species here that are recorded only from North America probably implies that they are both in reality cosmopolitan or nearly so.

To the 58 species enumerated above should be added six imperfectly represented *Cryptogams*, giving a total of 64 species; the following table contains an analysis of their distribution.

TABLE XVIII. *Analysis of the distribution of* Wind-introduced species.

Species present in both hemispheres :—		21
Cosmopolitan in the tropics (*Phanerog.* 3 ; *Cryptog.* 12)	15	
Almost Cosmopolitan (*Phanerog.* 1 ; *Cryptog.* 5)	6	
In Africa, Asia, Polynesia, America (*Cryptog.*)	2	
In Africa, Asia, America (*Phanerog.*)	1	
In Asia, Australia, America (*Cryptog.*)	1	
In Asia, America (*Cryptog.*)	2	
Confined to Old World :—		43
In Africa, Asia, Australia, Polynesia (*Cryptog.*)	1	
In Africa, Asia, Australia (*Cryptog.*)	1	
In Africa, Asia (*Cryptog.*)	1	
In Asia, Australia, Polynesia (*Cryptog.*)	3	
In Asia, Australia, (*Phanerog.*)	2	
In Asia, Polynesia (*Cryptog.*)	1	
Confined to Asia, (*Phanerog.* 18 ; *Cryptog.* 16)	34	
TOTAL of possibly wind-introduced species :—		64
Phanerogams	25	
Cryptogams	39	

We thus see that 32 per cent. of the species are cosmopolitan, but that at the same time as many as 53 per cent. are confined to South-Eastern Asia, figures which tend to shew that the agency of wind appears to be less active than we might expect. So far as the more local distribution is concerned we find that 40 species, or 62 per cent., may have reached the islands either from Indo-China or from Malaya ; 10 species, or 15 per cent., appear to be local species ; 3 species appear to have reached the islands from Malaya and one must have come either from Malaya or Ceylon, these four are, however, all *Cryptogams* and may possibly yet be found in Indo-China. Even if it be assumed that these do not occur in Burma, it leaves the south-west monsoon responsible for the introduction of only 6½ per cent. of this group of species. The remaining 10 species, or about 16 per cent. of the class, have more probably been introduced by the north-east monsoon, a circumstance that might be expected, seeing that this monsoon blows from the direction of the nearest land. And as this is the case it will follow that the probability is strong that most of the species which may, so far as their present distribution indicates, have come either from Indo-China or Malaya have in reality come from the north-east. The only species of the kind for which this is doubtful is *Chonemorpha macrophylla*,* which, though abundant in India and in the Himalaya, and equally so in Malaya and in the Andamans, has not yet been recorded from any part of Indo-China to the east of Khasia and Sylhet.

The last group of introduced species—those carried by birds—has now to be considered. In discussing this it its necessary to distinguish between species the seeds or fruits of which may arrive attached to the bodies of birds, and species of which the fruits and seeds have been eaten. The species carried externally will be first considered and may further be conveniently subdivided into two sub-groups, *viz.*, species that have probably been introduced only by swimming- or wading-birds, and species introduced by birds of any kind. The species of the first kind give a sub-group distinguished by an aquatic or paludine habitat, and characterised by small inconspicuous fruits or seeds that readily become attached, along with pellets of mud, to the feet, the leg-feathers, or the feathers at the base of the bill, of birds frequenting pools and marshes. The following table exhibits the whole of this kind present in the Coco Group.

TABLE XIX. *Distribution of the species probably introduced by swimming or wading birds.*

		S. E. ASIA					
	Africa.	India.	Indo-China.	Malaya.	Australia.	Polynesia.	America.
Nymphæa Lotus	×	×	×	×	—	—	—
Limnanthemum indicum	×	×	×	×	×	×	×
Hygrophila quadrivalvis	—	×	×	—	—	—	—
Lippia nodiflora	×	×	×	×	×	×	×
5. Polygonum barbatum	×	×	×	×	×	—	—
Zanichellia palustris	×	×	×	×	×	×	×
Cyperus polystachyus	×	×	×	×	×	×	×
Cyperus elegans	—	×	×	×	—	—	—
Cyperus dilutus	—	×	×	×	—	—	—
10. Fimbristylis quinqueangularis	×	×	×	×	×	—	—
Fimbristylis miliacea	×	×	×	×	×	—	×
Scirpus subulatus	×	×	×	—	—	—	—
Paspalum scrobiculatum	×	×	×	×	×	—	—
Panicum Myurus	×	×	×	×	×	×	×
15. Ceratopteris thalictroides	×	×	×	×	×	×	×
Chara fœtida	—	×	×	×	—	—	—

The next table gives the analysis of this distribution; the most striking feature the two tables reveal is the extent to which species of this kind are cosmopolitan. Among the non-cosmopolitan species the indications are altogether in favour of introduction from the northward and westward, for while only 10 of the species occur in Australia, and only the 6, which are all cosmopolitan, occur in Polynesia, 12 occur in Africa and 7 in America. Of the more local distribution we learn that none need necessarily have been introduced from Malaya since the 14 that occur there all occur in India and Indo-China also, while two that occur in India and Indo-China but do not occur in Malaya must have been introduced from the north. This being the case the probability is that the others have mainly been introduced from the same direction, a circumstance quite in accordance with expectation, since it is from the north that the stream of migration of marsh- and water-birds annually flows. During our visits to the islands snipe were found in the meadow near the lake on Great Coco, while teal and other water-birds frequented the lake itself and abounded in the lagoon on Little Coco.

TABLE XX. *Analysis of distribution of* Marsh *and* Aquatic species.

Present in both Hemispheres :—		7
Cosmopolitan in the tropics:	6	
Nearly cosmopolitan (absent from *Polynesia*)	1	
Confined to Eastern Hemisphere		9
Africa, Asia, Australia	3	
Africa, Asia	2	
Confined to South-eastern Asia	4	
TOTAL species probably introduced by water-birds		16

The second kind of species that may be introduced by becoming attached externally to birds is somewhat more difficult to deal with. *Urena lobata*, which is here clearly not a weed, may have been introduced in this way: its fruits sticking, burr-like, to the feathers of some bird; *Buettneria andamanensis*, might also have been thus introduced, though this is not so probable as in the other case. Three of the *Desmodia*—*Desmodium triquetrum*, *D. laxiflorum* and *D. polycarpon*—may very well owe their introduction to this mode of dispersal. *Boerhaavia repens*, as has already been said, is probably sea-introduced, though there is no reason why it may not partly owe its dispersal to bird-agency. Its habitat on these islands is always the rocky headlands or isolated rocks along the coast on which sea-birds sit to devour the *Grapsus* crabs they capture on the wave-washed ledges below, and nothing is more likely than that the fruits may become at times attached to their feet and be carried at least from point to point along the coast. The *Pisonias* may both very well have been introduced in this fashion, though it is less likely as regards *P. aculeata* than as regards *P. excelsa*. From what has been already said of this tree in discussing it among the "littoral" species, it will be evident that its fruits are of such a nature as to admit of their being carried for great distances attached to a bird's feet or body, if only the bird should happen to come in contact with them, and the objection that scraping-birds, which might do so, are not often migratory, while frugivorous birds, which are migratory, would not come in contact with the fruits because they are not likely to alight on a *Pisonia*, is not a valid one.

Though many such birds, as for instance *Carpophaga bicolor*, appear always to feed on trees and therefore would probably very rarely come in contact with *Pisonia* fruits, many others, as for instance *Calœnas nicobarica*, appear to feed as much or more on the ground, on fallen ripe fruits, as on the trees that bear the fruits they eat.* And in such a case there is no doubt that they might very easily come in contact with *Pisonia* fruits. Though essentially a beach-forest tree, the writer has collected specimens of *Pisonia excelsa* (and the tree was plentiful where he did so) three or four miles inland and 250—300 feet above sea-level; some mode of dispersal other than, or at any rate supplementing, ocean-dispersal, must therefore, as has already been pointed out, be postulated as regards this species. Of the grasses placed in this list *Andropogon contortus* already mentioned as possibly wind-introduced, much more probably owes its presence to this mode of introduction *Oplismenus compositus* is also sufficiently well endowed to render this mode of introduction likely. The only *Cryptogam* likely to have been thus introduced is *Acrostichum appendiculatum*, the spores of which might easily get brushed off by the feathers of a bird walking through a patch of it. This would also apply to the seeds of *Calanthe*.

The following table gives the names and distribution of the species likely to be thus introduced or likely to have their local dispersion assisted by this means.

TABLE XXI. *Distribution of species probably introduced attached to the feet or feathers of land-birds.*

SPECIES.	Africa.	S. E. ASIA.			Australia.	Polynesia.	America.
		India.	Indo-China.	Malaya.			
Urena lobata	×	×	×	×	×	×	×
[Buettneria andamanensis]	—	—	[×]	—	—	—	—
Desmodium triquetrum	×	×	×	×	—	—	—
Desmodium laxiflorum	—	—	×	×	—	—	—
5. Desmodium polycarpum	×	×	×	×	×	×	—
[Loranthus longiflorus]	—	×	×	×	—	—	—
[Boerhaavia repens]	×	×	×	×	×	×	—
[Pisonia aculeata]	×	×	×	×	×	—	×
Pisonia excelsa	—	—	[×]	×	—	—	—
10. Calanthe veratrifolia	—	×	[×]	×	×	—	—
Oplismenus compositus	×	×	×	×	×	×	—
Andropogon contortus	×	×	×	×	×	×	×
Acrostichum appendiculatum	—	×	×	×	—	—	—

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* This at least was the writer's experience in Batti Malv, the small uninhabited almost inaccessible island of the Nicobar Group already referred to, where *Calœnas nicobarica* breeds, and on which thousands of individuals of this species congregate.

The list is so short that an analysis of it is unnecessary; it is sufficient to note that the possibility of introduction from Malaya or from Indo-China is, so far as its evidence goes, evenly balanced.

While the two lists probably include all the species usually introduced by being attached externally to birds they do not exhaust all the possibilities of the case. For, if the mud of a marsh may fix the seeds or fruits of paludine species to the feet or head of wading-birds, other substances may fix the seeds of forest species to the bodies of forest-birds. There is almost no limit to the number of species that might be suggested as introduced in this way, provided their seeds be sufficiently small; this very circumstance, combined with the necessarily hypothetical nature of the subject, makes it impossible to attempt the suggestion of this mode of dispersal in connection with any particular species.*

The next kind of "bird-introduced" species to be considered—those introduced in consequence of having been eaten—may also be conveniently divided into two sub-groups; one consisting of species where dissemination by birds is an every-day process, the other consisting of species that can only be occasionally disseminated in this fashion since the process implies the destruction of the bird itself.

The first sub-group corresponds fairly closely with those species that have pulpy fruits with a hard stone or with hard indigestible seeds. It cannot, however, be held to include all these, for though birds *do* eat the pulpy part of the fruits of *Canarium*, *Spondias* and *Dracontomelum*, the stones of these are too large to be swallowed; probably therefore some other mode of dispersal must be held accountable for the presence in these islands of species of those genera. For *Dracontomelum* introduction by the sea has been suggested, though doubtfully; the others are left, with some reluctance, among the "remanent" species. There are other species for which this agency is only doubtful, such as *Miliusa*, the fruits of which do not look very inviting—some *polyalthias* are, however, so dispersed, *e. g.*, *P. longifolia* by frugivorous bats; *Physalis minima* might well enough have been introduced in this way, but is, all things considered, more probably sea-introduced; some of the *Convolvulaceæ* may also have been thus introduced. Moreover it must not be forgotten that indirect introduction in this way is not impossible. As has been pointed out, some of the fruit-eating pigeons are ground-feeding creatures, and if a sticky pulpy fruit should fall into a patch of *Oplismenus*, *Panicum*, *Aneilema*, or other small-fruited or -seeded herbaceous ground-species, the seeds or fruits of these may become attached to the fruits in question and, if then swallowed unnoticed by a fruit-eating bird, be voided uninjured along with the stone or seeds of the fruit itself and subsequently germinate. The subjoined table gives a list of all the species probably directly introduced; the indirect method, as being too hypothetical for discussion here, is not mentioned in connection with any particular species.

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* The following facts will shew that, though necessarily hypothetical, the subject is not far-fetched but is, on the contrary, highly deserving of attention. When in Narcondam the writer was particularly anxious to obtain the seeds of a species of *Bombax* present there, for sowing at Calcutta; for some days the search was hopeless because the capsules as they ripen are broken open and the seeds are eaten by a species of Horn-bill that is common in the island, while any seeds that escape the birds and fall to the ground are devoured by the rats that swarm in the place. At length under one tree, where there happened to be on the under-growth one or two large spider's webs, four seeds were found sticking in these webs; these were the only seeds he was fortunate enough to obtain; they were brought to Calcutta, germinated there, and the four young trees are now alive in the Botanic Garden. This will shew that seeds easily may, and at times do, stick in spider's webs.

In spring 1890 [illegible] Barbet was found lying on the ground in the Botanic Garden unable to fly; on being picked up and examined it was found that its left wing and left leg were fixed together by means of a spider's web; on freeing these it was found that the toes of its left foot were further bound up in a ball and the flight-feathers were firmly tied together. When finally completely freed from its entanglement the bird flew away, frightened, but physically uninjured. This will shew that birds do sometimes come in contact with spider's webs and that these are capable not merely of fixing objects to a bird's feathers but of fixing these feathers so that the bird itself cannot move them.

All that is therefore required in order to establish the truth of the hypothesis is direct observation of a bird having come in contact with a spider's web which happened to have seeds lodged in it at the time, and of its carrying away seeds and web together.

As in the case of species introduced by wind the occurrence of species of this kind in the islands of Narcondam and Barren Island is given; these being islands for which it is necessary at the outset to exclude from consideration any hypothetical "remanent" element.*

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* This part of the list is not so complete as it might be, since owing to the pressure of other duties the writer has not yet been able to complete the examination of the species collected by him in those islands in April 1891. This much may be said, that all the species quoted as occurring there do occur. But many of the others though not present are represented by nearly allied species and by species of this kind. There is for example at least one *Grewia* in Narcondam, there are several *Rubiaceæ* and there is an *Amorphophallus*. In Narcondam too there is a species of *Strychnos*, while a species of *Eugenia* is common in Barren Island. These two isolated localities therefore present two genera, with species that have fruits of the kind now discussed, of which no representatives were met with in the Coco Group. Similarly Batti Malv, equally isolated, and quite uninhabited, has an *Alangium* and a *Datura*; it may therefore be repeated that this list by no means overstates the possibilities of the agency in such a locality as this.

TABLE XXII. *Species probably introduced by fruit-eating birds.*

SPECIES.	Africa.	S. E. ASIA.			Australia.	Polynesia.	America.	Narcondam.	Barren Island.
		India.	Indo-China.	Malaya.					
[Miliusa sp.]	—	—	[×]	—	—	—	—	—	—
Capparis sepiaria	—	×	×	×	—	—	—	×	×
Capparis tenera	—	×	×	—	—	—	—	×	×
Grewia lævigata	×	×	×	×	×	—	—	—	—
5. Grewia Microcos	—	×	×	×	—	—	—	—	—
Glycosmis pentaphylla	—	×	×	×	×	—	—	×	—
Garuga pinnata	—	×	×	×	—	—	—	×	—
Aglaia andamanica	—	—	[×]	—	—	—	—	?	—
Cansjera Rheedii	—	×	×	×	×	—	—	×	—
10. Sarcostigma edule	—	—	[×]	—	—	—	—	—	—
Salacia prinoides	—	×	×	×	—	—	×	—	—
Zizyphus Œnoplia	—	×	×	×	×	—	—	—	—
Vitis pentagona	—	—	×	—	—	—	—	—	—
Vitis carnosa	—	×	×	×	×	—	—	—	—
15. Vitis pedata	—	×	×	×	—	—	—	×	—
Leea hirta	—	×	×	×	—	—	—	×	—
Erioglossum edule	—	×	×	×	×	—	—	×	—
Allophylus Cobbe	—	×	×	×	×	—	—	×	—
Sapindus Danura	—	×	×	—	—	—	—	—	—
20. Pometia tomentosa	—	[×]	×	×	—	—	—	—	—
Odina Wodier	—	×	×	—	—	—	—	×	—
Semecarpus subpanduriformis	—	—	×	—	—	—	—	—	—
Semecarpus heterophylla	—	—	[×]	×	—	—	—	×	×
Memexylon edule	—	[×]	×	×	—	—	—	×	—
25. Modecca cordifolia	—	—	[×]	×	—	—	—	—	—
Trichosanthes palmata	—	×	×	×	×	—	—	×	—
Mussænda calycina	—	×	×	×	—	—	—	—	?
Pavetta indica	—	×	×	×	×	—	—	—	—
Psychotria adenophylla	—	—	×	—	—	—	—	—	—
30. Pæderia fœtida	—	—	×	×	—	—	—	×	×
Ardisia humilis	—	×	×	×	—	—	—	×	—
Rauwolfia serpentina	—	×	×	×	—	—	—	—	—
Erycibe paniculata	—	×	×	×	×	—	—	—	—
[Physalis minima]	×	×	×	×	×	×	×	—	×
Myristica Irya	—	[×]	×	×	—	—	—	—	—
35. Myristica glauca	—	—	[×]	×	—	—	—	×	—
Dehaasia Kurzii	—	—	[×]	—	—	—	—	—	—
Bridelia tomentosa	—	×	×	×	×	—	—	×	—
Bridelia Kurzii	—	—	[×]	—	—	—	—	—	—
Flueggea microcarpa	×	×	×	×	×	—	—	×	—
40. Phyllochlamys spinosa	—	×	×	×	—	—	—	—	—
Plecospermum andamanicum	—	—	[×]	—	—	—	—	—	—
Ficus Benjamina	—	×	×	×	×	—	—	—	—
Ficus Rumphii	—	×	×	×	—	—	—	×	×
Ficus retusa	—	×	×	×	×	—	—	×	×

SPECIES.		Africa.	S. E. ASIA.			Australia.	Polynesia.	America.	Narcondam.	Barren Island.
			India.	Indo-China.	Malaya.					
45. Ficus brevicuspis	... ...	—	—	[×]	×	—	—	—	—	—
Ficus callosa ...	... ...	—	×	×	×	—	—	—	—	—
Ficus hispida	... ...	—	×	×	×	×	—	—	×	×
Ficus grisea ...	... ...	—	—	×	—	—	—	—	—	—
Antiaris toxicaria	... ...	—	×	×	×	—	—	—	—	—
50. Artocarpus Gomeziana	... ...	—	—	[×]	×	—	—	—	×	—
Zingiber sp. ...	... ...	—	—	[×]	—	—	—	—	—	—
Costus speciosus	... ...	—	×	×	×	—	—	—	—	—
Smilax macrophyllus	... ...	—	×	×	—	—	—	—	—	—
Asparagus racemosus	... ...	—	×	×	×	—	—	—	—	—
55. Dracæna spicata	... ...	—	×	×	×	—	—	—	—	—
Amorphophallus sp.	... ...	—	—	[×]	—	—	—	—	—	—
Pothos scandens	... ...	—	×	×	×	—	—	—	×	—

The most remarkable feature of the list is that it gives us for the first time a well-defined group of species none of which extend to America or even to Polynesia, and only two of which extend to Africa, though no fewer than 15, or 27 per cent., extend to Australia. The remaining 40 are confined to South-Eastern Asia. As regards their more local distribution there, 17, or 31 per cent., are confined to lands lying to the east of the Sea of Bengal, while 3 more occur in Ceylon but not in India, a circumstance which perhaps indicates that birds which feed on these species pass from Malaya to Ceylon but do not visit India. If this be the case the agency of frugivorous birds may partly explain the existence of a Ceylon element in the flora of the Andamans generally, a circumstance that has, as already said, been made the subject of remark by the late Mr. Kurz, (*Report on the Vegetation of the Andaman Islands*, p. 15); this point will be more fully discussed below.

As many as 36 species, or 64 per cent., occur both in Indo-China and in Malaya; as 15 pass southward to Australia while 14 pass northward to South China, and 5 pass southward to Malaya without going north to Indo-China, while 5 reach the islands from Indo-China without extending to Malaya, we may conclude that, though this element in the flora is distinctly non-Indian, the Indo-Chinese and Malay-Australian influences are, so far as it is concerned, evenly balanced.

Since the active agency in the dispersal of these species is that of fruit-eating birds, it ought to be possible to show that the known migrations of these creatures sufficiently explain their distribution. For all the species that occur in the Malay Archipelago this is extremely easy to do. The western half of the Malay Archipelago is particularly rich in fruit-eating pigeons and, as this area lies on both sides of the equator, the annual changes of season must cause the fruit-eating species, following the fruits on which they feed as these become mature, to oscillate from side to side of the equator. The same condition will ensure further migration from Southern Malaya to North Australia and *vice versa* on the one hand, and from Northern Malaya to the Nicobars and Andamans and *vice versa* on the other. It is not necessary to suppose that any particular fruit-eating bird must range from one end to the other of the area here considered, though some species, like *Calœnas nicobarica*, which extends from these islands to New Guinea, nearly or altogether do so; it is sufficient to know that such birds are seasonal visitants in any given locality, as is true of *Carpophaga bicolor*, *Carpophaga insularis*, *Calœnas nicobarica*, and many other species in those very islands; the region depleted of one set of species by the migration of these towards the north is filled with individuals representing another set coming from an area still further south. By the necessary over-lapping of the ranges of migration of different birds a continuous chain of dispersal is kept up and, even if Malayan birds never go further north than these islands, the process is continued by the arrival from and departure to the opposite point of the compass, of Indo-Chinese species; it is therefore not surprising to find that, where the climatic conditions still continue favourable, the same bird-distributed species of *Phanerogams* extend from North Australia through all the intervening areas to Southern China. This being so, the appearance of the same species in India and in Malaya, which is the case in 33 species, or 58 per cent., of the group, is simply explained. Certain species of birds, instead of only passing southward from China to Indo-China, pass also south-westward to the Eastern Himalaya or to the Assam valley, from whence these, or other, species of birds carry the seeds of the plants in question still further south-westward into peninsular India. This may explain also why certain species, like *Pæderia fœtida*, extend from Malaya northwards to Indo-China on the eastern line of migration, but on the western extend only southward to the Eastern Himalaya and not into India; the species of birds that eat their fruits may perhaps not migrate on the more western line of migration further south than the Himalayan slopes. The same reasoning applies to those species, of which there are 3, or about 5 per cent., that extend to Southern India on the western line of migration but do not go as far as Malaya on the eastern line. The species that are common to these islands and to Ceylon are more difficult to explain. If we felt certain that they are species of distinctively Ceylonese type and that they occur, out of Ceylon, only in these islands, we might suppose that Ceylon birds are occasionally driven by storms as far as the Coco Group and consider the dispersal of the seeds of such species as one of the indirect sequels of cyclones of unusual severity. The birds even need not be different, as regards species, from those commonly found in the Andamans; they need only be individuals that have followed the western instead of the eastern line of migration southward, and that under exceptional circumstances have passed directly from one line of migration to the other, carrying in their crops seeds or fruits that are characteristic of the line of migration from which they have been driven. If the species are not of Ceylonese type, their occurrence both in Ceylon and the Cocos may, as has been said already, only indicate that they have been brought directly from Malaya or Australia by southern birds that migrate to Ceylon as well as to the Coco Group but do not go as far north as peninsular India.

The remaining sub-group consists of species with seeds or fruits that are eaten by birds of different kinds, not for the sake of any pulpy portion, but on account of the nutritious properties of the whole fruit or seed. We have to realize that the dispersal in this case is not, as in the case of pulpy fruits the seeds of which are afterwards voided, an ordinary circumstance, inasmuch as the seeds are eaten for their own sake and are of necessity digested by the birds that eat them. But though it is not perhaps a common occurrence—the numbers of migrating grain- or seed-eating individuals considered—for newly-arrived birds to be killed, there is no doubt that a certain proportion, tired out by their long flight, must fall victims to raptatorial birds immediately on their arrival, the grains or seeds that their crops may contain falling aside and possibly germinating. Besides this means of introducing such species, and, even if the results be slight, it must nevertheless be in constant operation, there is the further possibility of similar species being introduced during severe cyclones, owing to birds that have been driven to land being captured and devoured, while exhausted by the buffeting of the tempest, by birds or beasts of prey. In this way not only the grain- or seed-eating species that ordinarily visit the islands, but species both of this and of the fruit-eating class that do not usually reach the group, may conceivably arrive and as conceivably bring with them the seeds of plants that birds which are normal visitants have no opportunity of meeting with or may not care to eat. It has to be admitted, however, that species for which this mode of introduction is claimed may with some degree of reason be looked upon as distinctly, though indirectly, introduced by wind.*

The species for which this mode of introduction is conceivable are given below. That many of them *must* be introduced species their presence in Narcondam and Barren Island testifies ; it is therefore, as regards these, somewhat on the principle of exclusion that they are referred to this class, and for some of them, such as *Abrus precatorius*, it is doubtful if it be not rather the sea that is responsible for their appearance.

TABLE XXIII. *Species perhaps introduced by seed- and grain-eating birds.*

SPECIES.	Africa.	S. E. ASIA.			Australia.	Polynesia.	America.
		India.	Indo-China.	Malaya.			
Cyclea peltata	—	×	×	×	—	—	—
Abrus precatorius	×	×	×	×	×	×	×
Abrus pulchellus	—	×	×	×	—	—	—
Mucuna pruriens	×	×	×	×	×	×	×
5. Acacia pennata	×	×	×	×	—	—	—
Albizzia Lebbek	×	×	×	×	×	—	—
Albizzia procera	—	×	×	×	—	—	—
Ipomœa Turpethum	×	×	×	×	×	×	—
Pollia zorzogonensis *var.*	—	—	[×]	×	—	—	—
10. Commelina obliqua	—	×	×	×	—	—	—
[Aneilema ovatum]	—	—	×	×	—	—	—
Panicum colonum	×	×	×	×	×	×	×
Panicum Helopus	×	×	×	×	×	—	—
Panicum javanicum	—	—	[×]	×	—	—	—
15. [Panicum ciliare]	×	×	×	×	×	×	×
[Ischæmum ciliare]	—	×	×	×	×	—	—
[Eleusine indica]	+	×	×	×	×	×	×
[Dendrocalamus strictus]	—	×	×	—	—	—	—

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* That there is nothing extravagant in claiming this as a possible means of introduction, the following passage (which refers, as it happens, to one of the islands under discussion), will sufficiently prove :—" Mr. Hawkins told us that when " the storm was over * * * * * * * * * * * * *
" every hollow of the island was tenanted by hundreds of numbed or wounded " sea-birds of all descriptions (such as he had never seen near the island before or " since) so terrified or exhausted that he picked up or took home several of them to " the light-house to show to his wife. Mixed with these were a certain number " of pigeons, parrots, and other land-birds, but the great majority were Petrels, " Terns, Whale-birds and such like sea-fowl with which his experience as a sailor " in southern seas had made him familiar. Most of these birds ultimately recovered " and left the island, but many of them hung about it for weeks, and for many " days remained so tame that they would not move from the ground or the rocks,

Of the above, *Cyclea peltata*, *Abrus precatorius*, *Acacia pennata*, *Albizzia Lebbek*, *Albizzia procera*, *Ipomœa Turpethum*, and *Pollia zorzogonensis* occur in Narcondam. With few exceptions they are widely distributed species; five are cosmopolitan, one extends throughout the Eastern Hemisphere and thence to Australia and Polynesia, two extend from Africa and Asia to Australia, one occurs in Asia and Africa, one in Asia and Australia; only eight species, or less than half of the group, are confined to South-Eastern Asia. Of these latter, three are confined to the countries east of the Bay of Bengal; two of them, *Panicum javanicum*, and the particular variety of *Pollia zorzogonensis* that occurs, are moreover distinctively Malayan, as opposed to Indo-Chinese, plants. On the other hand one species, *Dendrocalamus strictus*, is as distinctively an Indian or Indo-Chinese plant.

We have now in conclusion to consider the "remanent" species, a list of which is given in the subjoined table; in a few cases where introduction is remotely possible the agency that may have been responsible is indicated.

"where they happened to alight, to make way for the keeper or his men." (*Hume; Stray Feathers*, vol. ii, p. 113–4.)

In this passage we have all the evidence that is required to show that not merely the usual visitants but even unusual ones may at times be driven to, or seek shelter on, these islands when in an exhausted or injured condition, and to show that this is as likely to happen to grain-, pulse-, and seed-eating species as to fruit-, or fish-, crustacean- or mollusc-eating ones It is of little moment that the fish- or crustacean-eating species must always be the more numerous, if we know that species of the other kind are at any time driven to the islands in this state. All of these exhausted and injured creatures certainly do not recover or escape destruction. As regards those that simply die, when the insects that abound have eaten all but their bones, the seeds that may have been contained in their crops must fall aside and may germinate and grow. And as regards those that are killed and devoured it would be remarkable if a few of the seeds in their crops did not thus fall aside and obtain an opportunity of germinating.

Even if no other creature that exists in these islands were capable of, or likely to, catch and eat such exhausted birds, the presence of a large lizard—*Hydrosaurus salvator*—which is very common, is sufficient to account for the destruction of many of them. During our visit to Little Coco one of the officers of the "*Investigator*" shot two *Carpophaga bicolor*—right and left—by the side of the lagoon near the south end of the island. Before his attendant could reach the birds, which had fallen among the *Pandanus* bushes of the sea-fence, one of these lizards had already eaten all but the wings and head of one pigeon and had torn open the breast of the second ere it could be interrupted in its feast. On a previous occasion a *Hydrosaurus* was killed as it was apparently about to seize a Teal that had just been shot and had been laid down on a rock in the same lagoon. On opening up this creature its stomach was found to contain already a large land crab, two fishes, and a quantity of grassy roots (apparently those of *Scirpus subulatus*).

TABLE XXIV. *Possibly "Remanent" species of the Coco Island flora.*

SPECIES.	Africa.	S. E. ASIA.			Australia.	Polynesia.	America.	Possibly introduced by
		India.	Indo-China.	Malaya.				
*Miliusa sp.	—	—	[×]	—	—	—	—	
[Cyclea peltata]	—	×	×	×	—	—	—	? Birds.
*Antitaxis calocarpa	—	—	[×]	—	—	—	—	
Alsodeia bengalensis	—	—	×	—	—	—	—	
5. Dipterocarpus pilosus	—	—	×	×	—	—	—	
Dipterocarpus alatus	—	—	×	×	—	—	—	
Sterculia villosa	—	×	[×]	—	—	—	—	
*[Sterculia rubiginosa *var.*]	—	—	[×]	—	—	—	—	? Ocean.
Sterculia parviflora	—	—	×	×	—	—	—	
10. Sterculia alata	—	×	×	×	—	—	—	
Sterculia colorata	—	×	×	—	—	—	—	
Sterculia campanulata	—	—	×	×	—	—	—	
Buettneria andamanensis	—	—	[×]	—	—	—	—	
Berrya Ammonilla	—	×	×	+	—	—	—	
15. *Grewia calophylla	—	—	[×]	—	—	—	—	? Birds.
*Canarium euphyllum	—	—	[×]	—	—	—	—	
Amoora Rohituka	—	×	×	×	—	—	—	? Birds.
Chickrassia tabularis	—	×	[×]	×	—	—	—	
Phlebocalymna Lobbiana	—	—	×	—	—	—	—	
20. Glyptopetalum calocarpum	—	—	[×]	—	—	—	—	
Siphonodon celastrineus	—	—	[×]	×	—	—	—	
Ventilago calyculata	—	×	×	×	—	—	—	
Parishia insignis	—	—	[×]	—	—	—	—	
Spondias mangifera	—	×	×	×	—	—	—	
25. [Dracontomelum mangiferum]	—	×	×	×	—	×	—	? Ocean.
Connarus gibbosus	—	—	[×]	×	—	—	—	
Pueraria Candollei	—	—	×	—	—	—	—	
Pueraria phaseoloides	—	—	×	×	—	—	—	
Pterocarpus indicus	—	×	×	×	—	—	—	
30. Derris scandens	—	×	×	×	×	—	—	
Mezoneuron enneaphyllum	—	[×]	×	—	—	—	—	
Adenanthera pavonina	—	×	×	×	—	—	—	
Acacia concinna	—	×	×	×	—	—	—	
Terminalia bialata	—	—	[×]	—	—	—	—	
35. *Lagerstrœmia hypoleuca	—	—	[×]	—	—	—	—	
*Lagerstrœmia sp.	—	—	[×]	—	—	—	—	
Illigera conyzadenia	—	—	[×]	—	—	—	—	
*Webera Kurzii	—	—	[×]	—	—	—	—	
Randia longiflora	—	—	×	×	—	—	—	
40. Diplospora singularis	—	—	×	×	—	—	—	
Ixora grandifolia	—	—	[×]	×	—	—	—	
Ixora cuneifolia	—	—	×	—	—	—	—	
Strophanthus Wallichii	—	×	×	—	—	—	—	? Wind.
Argyreia Hookeri	—	—	×	—	—	—	—	
45. Argyreia lanceolata	—	—	[×]	—	—	—	—	
Lettsomia peguensis	—	—	×	—	—	—	—	
Porana spectabilis	—	—	[×]	—	—	—	—	
Thunbergia laurifolia	—	—	×	×	—	—	—	

SPECIES.	Africa.	S. E. ASIA.			Australia.	Polynesia.	America.	Possibly introduced by
		India.	Indo-China.	Malaya.				
Strobilanthes phyllostachyus ...	—	—	×	—	—	—	—	
50. Eranthemum album	—	[×]	×	×	—	—	—	
Peristrophe acuminata ...	—	—	[×]	×	—	—	—	
Bragantia tomentosa ...	—	—	×	×	—	—	—	
Loranthus longiflorus ...	—	×	×	×	—	—	—	? Birds.
Phyllanthus columnaris ...	—	—	×	—	—	—	—	
55. Cyclostemon assamicus ...	—	—	×	—	—	—	—	
Aporosa villosula	—	—	×	—	—	—	—	
Croton sublyratus	—	—	[×]	—	—	—	—	
*Blachia andamanica ...	—	—	[×]	—	—	—	—	? Ocean.
Claoxylon longifolium ...	—	—	[×]	×	—	—	—	
60 Mallotus acuminatus	—	—	[×]	×	—	—	—	
*Mallotus andamanicus ...	—	—	[×]	—	—	—	—	
Cnesmone javanica	—	—	×	×	—	—	—	
*Livistona sp	—	—	[×]	—	—	—	—	
*Corypha elata	—	—	[×]	—	—	—	—	
65. *Calamus andamanicus ...	—	—	[×]	—	—	—	—	
*Calamus tigrinus	—	—	×	—	—	—	—	
Alocasia fornicata	—	×	×	×	—	—	—	? Birds.
Scindapsus officinalis	—	×	×	×	—	—	—	? Birds.
Dendrocalamus strictus ...	—	×	×	—	—	—	—	
70. *Xylaria clavarioides... ...	—	—	[×]	—	—	—	—	

To the 67 unequivocal species of this list 3 other apparently local *Fungi* should perhaps be added; it is, however, extremely probable that when they are better known they will be found to exist elsewhere, in which case they might be added to the list of wind-distributed species; the proportion that results is therefore :—

Migrant sp : Remanent sp : : 4 : 1.

It will be noted that not a single species which seems unquestionably "remanent" extends beyond South-Eastern Asia, and that the species which are here treated as such are only 67 in number, constituting no more than 20 per cent. of the flora. Of these species only 21, or 32 per cent., occur in India or Ceylon or both, and of these only one (*Sterculia villosa*) has not hitherto been found elsewhere to the east of the Sea of Bengal This "remanent" section of the flora may therefore be looked upon as distinctly non-Indian. The point to be ascertained further is whether this element indicates more strongly an Indo-Chinese or a Malayan influence. Thirteen of the species, indicated in the table by an (*) occur only in the Andamans or Nicobars, while seven more occur only in Tenasserim on the opposite shores of the Andaman Sea. But Tenasserim bears to the Malay Peninsula and Indo-China very much the relationship that the Andaman-Nicobar chain bears to Indo-China and the Malay Archipelago, and perhaps neither it nor the Andamans ought to be spoken of as physiographically a part either of Indo-China or of Malaya;* these 20 species cannot therefore be cited as indicating either an Indo-Chinese or a Malayan influence. The purely Indian *Sterculia villosa* must obviously be similarly excluded; there are therefore 21 species, or 32 per cent. of this group, that afford no evidence either way.

Of the remaining species, one-half, *i. e.*, 23 species, or 35 per cent. of the whole, occur both in Indo-China and Malaya; these also give no evidence as regards this question. Of the other 23, 15 extend from Indo-China to these islands (some of them, like *Dendrocalamus strictus*, not going further than the Coco Group), without extending to Malaya; while only 8 extend from Malaya to these islands without occurring in Indo-China. The "remanent" species, therefore, so far as this evidence goes, indicate the predominance of an Indo-Chinese element, a fact that is altogether in accordance with what we should expect from our knowledge of the configuration of the sea-bottom along the line of islands from Cape Negrais in Arracan to the Nias Islands and Sumatra.

Reviewing the results of the preceding paragraphs we conclude that 288 species, or 80 per cent. of the flora, may conceivably have been introduced: 33 species, or 9 per cent., by human agency; 94 species, or 28 per cent., by birds; 60 species, or 17 per cent., by winds and 101 species, or 28 per cent., by the sea. We find moreover that the evidence is in favour of the bird-introduced species having, so far as those brought by wading- and water-birds are concerned, been introduced from the north, and so far as those brought by frugivorous and by seed- or grain-eating birds are concerned, having come in almost equal numbers from Malaya or the Andamans to the south, and from Indo-China to the north. So far as wind-introduced species are concerned the influence of the north-east monsoon is apparently the more active; so far as the sea-introduced species are concerned the influence of currents from Malayan seas to the south-east has been paramount.

The subjoined table gives a synoptic view of the probable origin of the Coco Island flora.

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* The writer has proposed the name "Malay Isthmus" for the conjoint area that includes Tenasserim, the Andamans and the Nicobars, and believes that it will be found convenient to recognise this as a distinct phytogeographical subdistrict. See *Ann. Roy. Bot. Garden, Calcutta*, iii, 238.

TABLE XXV. *Synopsis of origin of* Coco Island flora.

Species possibly introduced, for the presence of which no former land connection need be necessary :—					288
Introduced by living creatures				127	
By human agency ; (largely cosmopolitan species)			33		
Intentionally ; (cultivated plants)		15			
Unintentionally ; (weeds)		18			
By birds, (perhaps also to a small extent by bats)			94		
Attached externally to their bodies		25			
Immediately ; (viscous- or prickly-fruited sp.)	9				
By mud ; (species introduced by water-birds, mainly from the northward)	16				
Carried in crops of birds ; (almost in equal proportion from northward and from southward)		69			
As a natural sequence of their mode of life ; (fleshy-fruited species)	55				
Accidentally, where bird must have been destroyed to admit of germination of seeds ; (by seed- and grain-eating birds) : [indirectly due to agency of wind]	14				
By other natural agencies				161	
By wind directly ; (sp. with seeds specialised for wind-carriage ; also small-spored *Cryptogams*)			60		
By the sea ; (mainly Malayan species)			101		
Marine species ; (mainly *Algæ*)		21			
Littoral species ; (mangrove-vegetation and beach-forest species)		80			
Species probably remanent and indicating former connection with adjacent land, (apparently Indo-China) :—					70
TOTAL of Coco Island species					358

Notes on some native Ephemeridæ *in the Indian Museum, Calcutta.*— *By* THE REV. A. E. EATON, M. A., F. E. S., *communicated by* THE SUPERINTENDENT OF THE INDIAN MUSEUM.

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The following notes concern a collection of 27 specimens of *Ephemeridæ* received from Calcutta in April 1889, comprising representatives of 10 species or 6 genera, *viz.*:—3 sp. of *Palingenia*, 1 of *Polymitarcys*, 1 of doubtful genus allied to *Hexagenia*, 2 of *Ephemera*, 1 of *Ephemerella* and 2 of *Epeorus*,—all of ordinary dimensions. From the absence of lesser species it may be inferred that these are the results of random captures rather than of careful collecting. A series of 21 specimens from the Tenasserim valley, in Mr. McLachlan's collection, yields representatives of 9 species in 8 genera, all (except one) of small size, and some of them remarkably beautiful.

PALINGENIA LATA, Walker.

Seven adult ♂ specimens, labelled respectively "Sibs $\frac{4405}{1}$ to $\frac{4411}{1}$."[1] Their wings are in a very slight degree warmer in tint than the "light vandyke brown" of the typical specimens in the British Meseum, and vary in unimportant detail from the wing-neuration figured in Trans. Lin. Soc. London, 2nd series, Zool. iii. pt. i. 1 b (1884). Fore tarsus ♂ rather shorter than the tibia: joint 1 short, 2 or 5 the longest, 3 subequal to 4; ungues nearly of one length, each with a minute hook. For other particulars *vide op. cit.* p. 26. This is the only dark-winged species found hitherto in Hindostan.

The next two species have wings of a light colour.

PALINGENIA ROBUSTA sp. nov.

Two adult ♂ specimens labelled "Cachar;" both mutilated and perhaps faded. Wings defective, brownish white, dusky where bruised, their stronger nervures light, raw umber brown, the weaker nervures paler; neuration similar in style to that of *P. lata*, but with fewer and and more distant veinlets distributed to the hinder half of the terminal margin. Head and notum light raw umber brown, the former blackish around the ocelli: pronotum varied with blackish or dusky markings comprising,—in front, an impressed sinnate transverse line ending opposite the middle of the backs of the eyes,—on each side, the border of a protuberance in front of the deep lateral depression,—behind a fine line along the transverse crease at the hind margin. Pleura, sternum, femora and fore tibiæ, dull, light yellowish brown (intermediate in tint between raw umber and brown ochre); fore tarsus and hinder tibiæ and tarsi paler or duller in colour, and transversely rugose: a short dusky line on the mesopleuron, between the root of the costa and the spiracle. Dorsum faded: the last 3 or 4 segments largely suffused with light, raw umber brown, the anterior segments less and less so; the joinings sometimes pale. Venter and forceps dull, light, yellowish brown. Setæ dirty whitish yellow, uniformly pilose. Fore tarsus shorter than the tibia: joint, 1 short; 2 subequal to, or very little longer than 5, 3 shorter than 5 but subequal to 4; ungues nearly of one length. Hinder tarsi uni-unguiculate. Terminal jointlets of the forceps-limbs nearly of one length, or the last a little longer. Length of body 25 m. m.

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[1] Presented to the Indian Museum by Mr. S. E. Peal, and collected in Sibsagar, Assam.

POLINGENIA MINOR, sp. nov.

Three adult ♂ specimens much damaged by cabinet pests: 2 labelled "Karachi Mus." and 1 labelled "Nattor." Wings dull white, with sub-opaque neuration; under a lense, in some lights, the cross-veinlets are bordered with milk-white. Neuration fairly comparable to that of *P. ampla* (*cf.*, Trans. Linn. Soc. London, 2nd Series, Zool. iii. pl. i. 1 c) but with the veinlets that end in the posterior half of the terminal margin shorter. Head brown ochre, blackish around the ocelli. Mesonotum light brown ochre, darker than the pronotum. Legs from some standpoints concolorous with the venter, the tarsi and hinder tibiæ shifting, with change of posture, to whitish. Colouring of abdomen effaced by pests, in the larger (Karachi) specimens; in the smaller (Nattor) one the dorsum is whitish ochre with whitish joinings anteriorly, but posteriorly is very light brown ochre, clouded in segments 6 and 7 to a small extent, and to a larger extent (half across the back) posteriorly in segments 8 and 9 with dark grey. Setæ extremely light brownish ochre in tint, uniformly pubescent. Fore tarsus little shorter than the tibia: joint 1 short, 5 rather longer than 2, 3 subequal to or little shorter than 2 and rather longer than 4; tibiæ and tarsi finely and transversely rugose. Terminal jointlets of the forceps-limbs of one length in the Nattor specimen, but in those from Karachi Mus. the last jointlet is rather the longer. Length of wing (Karachi exempl.) about 17, setæ about 50 m. m.

POLYMITARCYS sp.—

A single fragmentary ♀ of undescribed species, labelled "Raneeganj." In this genus discrimination is at present unsatisfactory owing to the meagreness of published descriptions. The specimen now under consideration differs from *P. indicus*, Pictet, in the colouring of the thorax and hinder legs. Whether his species can ever be indentified is excessively doubtful in the absence of precise record of locality of capture. Reference to the "East Indies" as the domicile of an insect is of little use to any but the general reader.

Genus——(unascertainable).

One defective ♀ subimago labelled "Sibs. S. E. P.," lacking the fore legs and the last 3 segments of the body, and having the fore wings badly folded up out of shape. This insect, judging from the wings, should be ranked as one of the *Ephemera Type*. The costel shoulder of the hind wings is rounded off obtusely, just as in *Hexagenia*, but the pronotum resembles that of a *Pentagenia*. Precise identification of the genus is precluded by the ruinous condition of the specimen.

Until now only three species of *Ephemera* have been described from India,—*E. immaculata*, Etn., from Cuna, *E. expectans*, Walker, from "Hindostan," and *E. supposita*, Etn., from Ceylon. Of these the first has no abdominal markings, but the others have linear dorsal and ventral markings. Two other species of Indian Mayflies, also with linear markings, have long been represented by single specimens in Mr. McLachlan's cabinet; and in the present collection there is sufficient additional material for their description. They are nearly related to *E. supposita*, which therefore may advantageously be treated of in this paper, although wanting in the Calcutta Museum.

EPHEMERA SUPPOSITA, Eaton.

Described from ♀ subimago in Baron E. de Selys-Longchamp's Museum; 1 ♂ im. in McLach. Mus.; compared with the ♀ subim. standing with the type-specimen of *Potamanthus* [= *Atolophlebia*] *fasciatus* in Hagen's collection, and with ♂ specimens in the British Museum: *cf.* Trans. Linn. Soc. London, 2nd Series, Zool. iii. 73, pl. viii. 12ᵉ (1883) or [for pattern of dorsal markings] Trans. Ent. Soc. London, (1871) p. 75. The following notes are supplementary to these earlier descriptions of the ♂ imago.

Neuration of the forewing distinct to the unaided eye when held over white paper, with perhaps the exception of only the branchlets of the intercalar veins annexed to the anal nervure; over a dark background, when viewed under a lense facing the light, the radius and the stronger parts of the subcosta of the forewing, and the cross veinlets in both wings remain dark, but the other nervures become pale; in transmitted light the nervures assume an amber tint. Membrane of the forewing (excepting the distinctly coloured parts) perfectly transparent in direct view: but held obliquely at a moderate distance, fronting the light, the finer of the longitudinal nervures transmit to it a faint yellowish grey; or pointing towards the light, the cross veinlets transmit to it a faint reddish grey: in proximity to the costa, the pterostigmatic portion of the marginal area is rather deficient in colour. I was probably mistaken in 1883 when I described the dorsal vessel as dark; but the ravages of cabinet pests preclude certitude on this point.

The dorsal abdominal markings of the best marked segments comprise six black longitudinal stripes or streaks united to one another by the burnt umber brown apical border of the segments,—three on each side of the back. In segments 9 to 7 two of the streaks, linear and subparallel with each other, lie close together beside the dorsal vessel, extending the whole length of the segment (the outer streak is rather broader than the other), while the third streak lies apart from them close by the pleuron. In the more anterior segments (*e. g.*, in the 3rd segment) the main trachea in front of the spiracle is dark, and the three streaks, in mutual contact at the apical margin, constitute a tripartite marking: the streak nearest to the dorsal vessel becomes abbreviated and subulate, but the other two combining either in the form of a V or as a pair of conjugate triangular streaks, extend nearly to the base of the segment. In the first segment, a quadrangular spot seems to be substituted for the streaks: the 9th ventral segment is bilineate lengthwise.

Terminal jointlets of the forceps-limbs short for an *Ephemera;* the last of them smaller, but little if at all shorter than the penultimate. The figure of 1883, cited above, is exact, and correctly leaves their proportions in the dried insect uncertain. Penis lobes subcylindrical. The admeasurement of setæ of ♀ im. stated in 1871 [*cf. E. faciata*] was spurious, being based upon a specimen of the next species, referred to in 1883 with an expression of doubt as to identity of the species.

Hab. Rainbodde, Ceylon.

EPHEMERA REMENSA, sp. nov.

Five ♂ imagos labelled "Kulu $\frac{\text{6942-'4, \& '6, \& '8}}{1}$," in Indian Museum; and 1 ♀ imago labelled "Musuri," 7,000 ft., June, Long, in McLach. Mus.

Imago (dried) ♂.—Genitalia similar to the ordinary European pattern in this genus: the last jointlet of the forceps-limb rather shorter than the penultimate. A pair of very broad black stripes, diminishing a little in breadth anteriorly, extend from the tip nearly to the base of the 9th ventral segment and end abruptly: the other ventral segments are bilineate longitudinally, excepting the first segment which is unmarked. Neuration of the fore wing distinct to the naked eye throughout (over white paper) excepting the branchlets of the intercalar veins annexed to the anal nervure, and the base-ward extremities of the longitudinal nervures posterior to the radius: under a lense, the portions thus visible, and the neuration of the hind wing, from certain standpoints only, appears of a uniform light pitch brown, but in most positions the finer of the longitudinal nervures acquire a brown amber tint, the stronger neuration and the cross veinlets remaining pitch brown or changing to pitch black. Wings transparent, tinted distinctly with very light raw umber grey throughout, with markings of raw umber brown. The markings of the fore wing comprise the submarginal area together with the extremity of the area next behind it, and narrow cloudy bordering along the subcosta in front and the radius behind (the former more extensive in the beginning of the pterostigmatic space) as well as along the cross veinlets; in addition to spots: in this sex the spots are larger than in the ♀ (but not much larger) and therefore are hardly so small as in *E. supposita;* the best marked are three in the usual positions in the midst of the wing, *viz:*—one at the præbrachial fork and the others on the cubitus and the first sector, but occasionally cross veinlets or the ends of nervures are clouded in the usual places of other spots found in species of *Ephemera*, such as at the inner ends of the shortest of the sectorial intercalar nervures, or at the junction of the pobrachial with the 2nd or 3rd cross veinlet beyond the fork of the præbrachial nervure, or near the base of the wing between the pobrochial and anal nervures either on the nearest cross-veinlet or at the extremity of the foremost intercalar nervure. The terminal margin of the hind wing is narrowly bordered with a light, raw umber grey cloud and several of the cross veinlets are pitch black.

The abdominal markings resemble those of *E. supposita* in most respects: those of the 1st segment are not well shewn in the specimens at hand: the 2nd segment in place of dorsal streaks has on each side an irregular transverse quadrangular blotch, narrowed upwards and obliquely truncate above; the 3rd to the 5th segments have two streaks and the 6th to the 8th segments three dorsal streaks on each side, all longitudinal and sub-parallel, the lowest of which is linear and narrow, the next to it double the width and usually more curved, and the innermost (where there are three) narrow and tapering at both ends. In the 9th segment a broad stripe takes the place of the lowest and the intermediate streak combined. On the pleura, in nearly every segment, is a short black dash at the base; but the 10th segment has a black blotch. Setæ light raw umber brown; the joinings mostly (excepting in the basal half of the median seta) narrowly dark brown. Fore femur in opaque view either raw umber brown or rufo-piceous: tibiæ dark pitch brown; tarsus lighter; trochanter and coxa subochreous. Hinder legs in opaque view, translucent yellow ochre, with the obtuse claw pitch brown. In transmitted light, the fore femur and tarsus become ferrugineous amber, and the hinder legs yellow amber.

♀ Very similar to the ♂. Thorax brown ochreous, with a black spot in front of each tegula, a black longitudinal stripe on each side of the pronotum, and a black irregular line down the outer side of the fore coxa. Fore femur brown ochreous; fore tibæ bistre brown or light pitch brown; fore tarsus paler. Wings nearly colourless, with indistinct and minute spots, placed singly at the bulla of the sub-costa, behind that on the cubitus, and at the fork of the præbrachial; another further out on the pobrachial; and one near the base of the fore wing at the commencement of the next intercalar vein. Hindwings spotless or with spots only faintly indicated.

Length of body ♂ 15, ♀ 18; wing ♂ 13-15, ♀ 21; setæ ♂ im. 26 & 28 to 30 & 34 m. m.

EPHEMERA CONSORS, sp. nov.

Two ♂ imagos labelled "Kulu $\frac{5854}{5}$ and $\frac{5855}{5}$," and two ♀ subimagos labelled "Kulu $\frac{5852}{5}$ and $\frac{5853}{5}$" in the Indian Museum; and 1 ♀ subimago labelled "Sikkim, 4,000 feet, 7 [*i. e.*, July] 80, H. J. Elwes, in McLach. Mus."

Subimago (dried) ♀.—Wings transparent, very faintly tinted with extremely light brown ochreous grey, or in the sub-marginal area of the fore wing with very light amber, with a small, blackish grey spot at the fork of the præbrachial nervure, another at the bulla of the sub-costa, and single greyish dots nearly in a straight line with them on the sector and cubitus of the fore wing. Hind wing spotless. Neuration of the fore-wing distinct to the naked eye (over white paper) from the costa to the sector, and then hardly discernible onwards to the pobrachial nervure: after that the minor neuration and the neuration of the hind wing cannot be distinguished. When magnified, the neuration of the hind wings and of the greater portion of the fore-wing is opaque and concolorous with the membrane: but many of the cross veinlets in the basal half of the wing shift in colour to piceous in certain postures, and all of them (excepting the greater cross-vein) anterior to the sector are pitch black. The pronotum is marked as in *E. remensa*, with a small oval black spot anteriorly on each side in a furrow: and in both species there is a small acute triangular black spot in front of the posterior coxa.

Imago (dried) ♂.—Terminal jointlets of forceps proportionally longer than in *E. remensa*, and more slender; the last jointlet shorter than the penultimate in the dried specimen: basal joint relatively short. Venter bilineate lengthwise interruptedly in the posterior segments: the lines are narrow and as far apart from each other in the 9th as in the preceding segments, and in the 5th, 4th and perhaps the 3rd segments become greatly abbreviated or even reduced to dots; but the 2nd and 1st segments are spotless. Wings much as in the ♀ subimago, but of course more transparent: the spots in the fore wing are similar but less distinct; the greater part of the neuration is (in opaque view) light raw umber brown changing (in transmitted light) either to brownish amber or (in the finer parts) to very light or whitish amber; but where visible without a lense, the cross veinlets when magnified appear pitch black or pitch brown in opaque view, and this colour remains fairly constant from most stand-points; the subcosta and radius and also in some positions the great cross vein are likewise piceous. Hind wing spotless, and clear throughout. Fore leg raw umber brown, blackened at the tip of the femur and at the base and tip of the tibia. Hinder legs light yellowish amber colour.

Abdomen pale ochraceous or whitish raw umber grey in the first 5 segments, and light brownish ochre in the hinder segments, marked with black lines and streaks disposed mainly in two longitudinal series: segment 1, spotless; segment 2, with a faint dot near the base on each side of the dorsal vessel, and a larger spot below the dot just above the main trachea, which spot is not represented in the other segments; in segments 3 to 9 the markings corresponding with the said dots take the forms of an oval spot in the 3rd segment, an abbreviated tapering streak in the 4th, a tapering streak produced to the hind margin in the 5th segment, and apparently continuous lines from the 6th to the 9th segment. Venter marked longitudinally, in segments 3 to 5 with two abbreviated tapering streaks; in segments 6 to 8 with two thin tapering lines; and in segment 9 with two linear stripes. Setæ ochraceous, with opaque joinings.

Dorsum of ♀ in segments 3 to 6 longitudinally bilineate, with an additional black line on each side in segments 7 to 9 parallel with and exterior to the principal lines in the hinder ¾ of each segment: on the pleura of most of the segments is a short marginal streak at the base, and a longer streak just inside the margin near the tip; on each side of the 2nd segment is an erect spot like a mark of exclamation. Hind wing spotless; neuration indistinct to the naked eye.

Length of body 12; wing ♂ 12, ♀ 15–21; setæ ♀ subim. about 17 m m. The specimens are infested with encysted parasites.

EPHEMERELLA sp.—

One ♀ subimago labelled "Kulu $\frac{5852}{5}$."

EPEORUS PSI, Eaton.

Epeorus psi, Etn., Trans. Linn. Soc., 2nd Ser. Zool. iii. 242 (1885).

Two ♀ subimagos labelled "Kulu" respectively. The larger specimen measures:—wing 24, setæ about 35 m. m.

EPEORUS sp.—

One subimago labelled "Kulu $\frac{5849}{5}$."

ERRATA IN MR. THEOBALD'S PAPER ON PUNCH-MARKED COINS IN JOURNAL, AS. SOC. BENG., VOL. LIX, FOR 1890.

p. 204 line 8 Transpose words 'Bulls' and 'Balls.'
,, ,, 13 after 'Assyrian' insert the word 'male.'
p. 206 ,, 10 for 'except' read 'expect.'
,, ,, 16 for 'and' read 'to need.'
,, ,, 17 for 'twined' read 'twinned.'
p. 215 ,, 4 for 'seem most' read 'appears.'
p. 227 ,, 29 for 'subtileties' read 'subtleties.'
p. 260 ,, 6 from bottom for 'river' read 'rim.'
p. 266 ,, 4 for 'pegs' read 'legs.'
,, ,, 8 from bottom after Myceno a full stop, and for 'the' read 'The.'
p. 268 ,, 4 from bottom for 'reasonably' read 'seasonally.'

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W. L. SCLATER, ESQ., M. A., F. Z. S.

AND

SURGEON-CAPTAIN J. H. TULL WALSH, I. M. S.

NATURAL HISTORY SECRETARIES.

> It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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Part II.—NATURAL SCIENCE.

No. I.—1891.

I.—*On certain Spiders which mimic Ants.*—*By* Surgeon J. H. Tull Walsh, I. M. S.

[Received 25th February; read 4th March.]

Whoever has studied the structure and habits of the various genera of the *Formicidæ* must have been struck by the "fitness" which these little creatures possess for "the struggle for existence." Even in those individuals with a rudimentary and useless sting there are still the powerful biting mandibles, the acid poison which can be ejected, often to a considerable distance, on to the enemy and various protective odours, such as those secreted by the anal glands of most of the *Dolichoderidæ.* The pangolin and other ant-eaters certainly cause havoc among the ants who make their dwellings in the ground, but smaller animals and birds cannot attack ants with impunity, and it is noticeable that the ants most frequently mimicked live and feed on trees. Such being the case the ant is well protected, and any other creature that, by an accident of natural selection, resembled an ant in form and colour would have obtained an advantage through this resemblance, all unconscious as regards the individual but conscious, if one may use such an expression, in relation to the orderly complexity of nature. The advantageous resemblance would, according to generally accepted laws, be transmitted and strengthened until the mimic reaped the full benefit accruing from its likeness to the ants among which it lived. Such instances of mimicry are seen among a certain sub-family of spiders, the *Attidæ*. These spiders, ant-like in form, and partially ant-like in habit, do not spin webs for the purpose of catching prey, but, wandering about in company with the ants they resemble, spring upon their victims from behind, (hence called by some Entomologists *Saltigradæ*). Their home is generally fixed to the under surface of a leaf and consists of a small oval, whitish, silky nest just big enough to accommodate the spider. Attention has been drawn to the presence of these spiders in America* and Africa†; Mr. Wood-Mason collected two or three specimens in Assam some years ago and Mr. Rothney‡ notes the occurrence of a *Salticus* in company with *Sima rufo-nigra* in the neighbourhood of Barrackpur. I have found these spider mimics in Orissa, and also in and near Calcutta, and have, during the last eighteen months, collected or acquired some eight or ten species or varieties belonging to genera of the sub-family *Attidæ*. With one or two exceptions all these spiders were found hunting with the ants they so closely resemble. The two most common are a variety of *Salticus formicarius* Linn. which mimics *Sima rufo-nigra* Jerd. and a pretty *Salticus* (sp. ?) which may be found in company with *Ocophylla smaragdina* Fabr. whose nests are extremely common on the trees in the Royal Botanic Gardens at Sibpur.

The resemblance in form and colour is so great that collectors have been deceived, and indeed except with a lens it is difficult often to say which is the ant and which is the spider; but at the same time it must be remembered that the likeness is greater when both are alive and moving than when the dead spider is compared with the dead ant. While the body in most sub-families of spiders is short and rounded with a constriction only between the cephalothorax and the abdomen, the mimic has a long thin body like that of an ant. There is a partial constriction marking off the cephalic from the thoracic portion of the cephalothorax, and that part of the spider's body which joins the cephalothorax to the abdomen is drawn out into a pedicle having on its upper surface nodes mimicking closely those on a ant's pedicle. The colouring of the spider is also a more or less correct imitation of that of the ant. A superficial resemblance could hardly go farther, but there is a still more wonderful point to notice. The spider has four pair of legs and no antennæ; the ant has three pair of legs and a pair of long antennæ which are generally kept in motion as the little animal runs along. In adapting themselves to circumstances, the spiders have learned to use their first pair of legs to represent antennæ. In all the cases that I have noticed, the spider when moving holds its first pair of legs aloft to simulate antennæ, and certainly in the case of a *Salticus* (sp. ?) which mimics *Camponotus micans* Mayr these legs are kept in continual motion. On one of the bottles presented to me by Mr. J. Wood-Mason I find the following note made at the time the spiders were captured :—

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* Bates, Trans. Linn. Soc. Vol. XXIII.

Belt "Naturalist in Nicaragua," p. 314.

Peckham "Protective Resemblances in Spiders." I have not been able to read this in the original and know of it only from references found in Poulton's "The Colours of Animals."

† J. P. Mansel Weale Nature Vol iii. p. 508.

‡ Jour. Bomb. Nat. Hist. Soc. Vol. V, p, 44.

"(Cachar, J. W.-M.) smaller one mimics and runs about with a little brown ant carrying its palpi like the open mandibles of the ants, and its first pair of legs off the ground and elbowed, as the ants do their antennæ."

This note draws attention to another curious resemblance which is produced by the flattening of the terminal joint of the palpi. In the spider found by Mr. Wood-Mason and in several other species, this formation occurs and the falces, which are small, are partly hidden by the palpi. In other species and notably in *Salticus formicarius* the palpi are small and the resemblance to mandibles is produced by the large flattened first joint of the falces ; thus the same end, as far as the resulting mimicry is concerned, is attained by two very different morphological variations. Belt (*l. c.*) notices the fact that in the Nicaraguan species the fore-legs are raised from the ground and J. P. Mansel Weale (*l. c.*) makes some interesting remarks which I will quote. He says :—

"The most perfect cases of mimicry I know of are two spiders (specific nature unknown to me) which have the closest resemblance to ants. They belong to the *Salticidæ* and are apparently related to *Salticus formicarius.* The one is smooth black and shining and runs rapidly on the ground and bark of trees, and resembles the ant which builds its nest in *Acacia horrida* and is used by the Kafirs for the purposes of torture. The other is larger and has its cephalothorax dull black and its abdomen covered with short yellowish hairs. It is generally found running on the stems of herbaceous plants and small bushes and closely resembles an ant found in similar situations. The fore-legs in both species are larger than the second pair are frequently held up when they closely resemble the antennæ of ants."

As a general rule therefore most observers agree that the first pair of legs is used to simulate antennæ, but an exception must be noted. E. G. Peckham (*l. c.*) records that an American species *Synageles picata* "holds up its second pair of legs to represent antennæ." This peculiarity of habit has apparently produced or been produced by a change in the relative length of the legs in this species. The general formula for the *Attidæ* seems to be 4, 1, 3, 2; the fourth pair of legs being the longest and the second pair the shortest. In *Synageles picata* the formula, to judge from a figure (*l. c.*), is 4, 2, 3, 1. *Synemosyna formica*, another American spider observed by Peckham, has the usual formula, but is said to use its second pair of legs as antennæ!

I have mentioned that the spiders are probably protected from birds and other enemies by their resemblance to ants, but there can be no doubt that frequently they also thereby gain another very considerable advantage. The ants with which these spiders "most do congregate" are fairly omnivorous feeders, but shew a decided preference for sweet juices often to be found exuding from trees, fruit or flowers. To these juices come also flies, small beetles and other insects which form the natural prey of the spider, and which do not, under the circumstances, particularly fear the ants. Thus while the flies are sucking up sweetness in company with the ants, the spider is no doubt able, under cover of his disguise, to approach near enough to make a spring upon his unsuspecting victim and fix his sharp falces into its body. As regards the ants themselves, they do not seem to take any particular notice of the spiders, and do not apparently attack them. One spider, a mimic of *Ocophylla smaragdina* was found by me in a nest of these ants with its little silky shelter attached to one of the leaves which formed part of the abode of probably the most fierce of all the ants found in Bengal. It may also be supposed that the spider does not attack or annoy the ants.

II.—*A List of the Butterflies of Engano, with some Remarks on the* Danaidæ.—*By* William Doherty, *Cincinnati, U. S. A. Communicated by the* Natural History Secretary.

[Received 21st February, 1891, read 4th March, 1891.]

(With Plate I, figs. 1—4.)

The long parallel lines of upheaval which characterize Burma are continued far into the Malayan region in the form of three great chains of islands and mountains. The most eastern of these, and the oldest, being chiefly composed of primitive rocks, consists of the Malay Peninsula, itself built up of several parallel ranges, the Riouw and Lingga groups, Banka and Billiton. The most western includes the Andamans and Nicobars, and the line of islands which may be called the Nias group, lying west of Sumatra, extending perhaps to western Java. Between these two the large island of Sumatra has been formed, probably in times geologically recent. No doubt some parts of Sumatra are composed of older rocks, but till the great volcanic upheaval occurred, its place was probably occupied by a few isolated islets, and to this day its fauna is chiefly made up of immigrants from the Malay Peninsula, and in the extreme south-west from Java, the number of endemic species being small. To understand the faunal relations of the Nias Islands, one must eliminate all idea of Sumatra from the mind. Until quite recent times, their relations were, I think, wholly with Java on the one side and the Nicobars on the other.

The Nias Islands lie like a broken breakwater along the western coast of Sumatra, in a line between five and six hundred miles in length, from Pulo Babi to South Pageh. They are separated from Sumatra by a deep channel nearly a hundred miles in breadth, but in two places more or less bridged by islands. Their united area is now only about 6000 square miles, equal to that of Yorkshire. But they seem to be the remains of a much larger mass of land. The deep sea that surrounds them swallows up all the alluvium from their streams; the tremendous surf on their western shore steadily undermines their hills, and under this process the islands have long been wearing away.

Engano lies much further south, and is wholly surrounded by deep sea, in which it might long ago have disappeared but for the coral reefs that protect most of its coast. It is only eighty miles from Sumatra, to which it has no faunal resemblance whatever. On the other hand, it is 180 miles from South Pageh in the Nias group, and 210 from Java. But on the side of Java there is only open sea, while on that of Nias there are three or four reefs and islets, and as might be expected from this, Engano may be zoologically considered as as an outlying member of the Nias group, with certain Javan affinities.

An excellent description of the people and products of Engano has lately appeared in the *Tijdschrift van Nederlandsch Indië*, but so little is said of the island itself, that I may be permitted a few remarks on the subject. The area seems to be incorrectly stated; it is about a hundred and twenty square miles. The eastern coast is low and flat, bordered in places by mangrove swamps. The western, where the hills attain a height of nearly a thousand feet, descends precipitously into a narrow lagoon filled with branching corals and coral-haunting fishes, and on the reef beyond, the surf of one of the bluest and deepest of seas beats continually with such violence that the whole island seems to shake under it. Engano seems now to be sinking; it has formerly been more or less submerged. A shell of coral rock covers almost the whole of it, thick over the eastern lowlands, thinning gradually to the westward, so that the streams generally break through it there, and flow through deep gorges. In some places the crust has given way so as to form deep little round dells, with stalactite caves piercing their sides, and a subterranean stream roaring at the bottom, hidden by dense vegetation. The people believe these places to be haunted by evil spirits, and when I wanted to be lowered into one to look for shells in the caves, they all objected most vehemently.

Beneath the coral, the rock seems everywhere a coarse, friable sandstone. If the Nias islands consist generally of this soft rock, it will go far to explain their present fragmentary state.

Until the present generation, the population consisted of a number of hostile tribes, and the older men are still proficient in the use of the spear, and delight in mimic battles and dramatic representations of the surprise of a sleeping enemy. In recent times native vessels have taken to coming to Pulo Dua, two small islands a mile or two off the western coast, for cargoes of cocoa-nuts, and it is probably the growth of this trade that broke down the tribal system. At present Javanese and Malays have now settled in several villages, though Pulo Dua still remains their headquarters, the plague of sandflies making life unendurable to them on the main island. It is to the trading vessels that the Enganese also owe the introduction of diseases that are rapidly killing them off. An outbreak of small-pox carried off all the inhabitants of the two villages near the southern end of the island, and to this day this district is called the Land of Ghosts, and no Enganese will set foot on it. No alcoholic liquors have been brought to Engano; whether this is owing to the precautions of the Dutch, or the religious scruples of the Sumatran traders, I do not know. But syphilis was introduced many years ago, and through it the race has lost all reproductive power. In some of the villages there are hardly any children, and the area of cultivated land decreases every year. The Dutch government, I believe, now contemplates leasing the island to capitalists, and in another century it seems likely that the natives will be entirely replaced by Javanese coolies working under European supervision.

The islanders are of about the same degree of civilization as the Nicobarese. Till lately they are said to have gone about almost naked, and their island is always called Pulo Telanjang or the Naked Island by the Malays. They grow no rice, nor do they make use of the pandanus and cycas as food like the Nicobarese. They make little temporary clearings, surrounded by a stout fence to keep out wild pigs. Their staple food is the taro or *kaladi*,* which they call *ayudapa*. They also have plantains, papayas and pumpkins, and eat quantities of cocoa-nuts, and drink the water in the nuts, the springs near the coast being usually brackish. They also draw toddy from the tree, though its use is not habitual as in the Nicobars. They keep fowls and a few pigs, feeding both on cocoa-nuts, and are expert in spearing fish and turtle. Thanks to this abundant diet and the rarity of famines, they have lost the woodman's instincts, and are little better acquainted with the forest and its vegetable and animal products, than are the rice-growing Malays of Borneo and Sumatra, who scarcely know the names of the commonest trees.

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* Our word *Calladium*, though it looks Greek enough, is derived from this, the Malay name of the plant.

Their origin will perhaps puzzle future investigators. Though their physiognomy is odd and characteristic, they seem to be more or less allied to the Nicobarese, but without the negrito strain which seemed to me obvious in some members of that race. The theory has been advanced that the Nicobarese are of Shan or Siamese blood, no doubt on philological grounds, as there is no personal resemblance. On the other hand, the Malays are physically almost indistinguishable from the Siamese, and may roughly be defined as a Shan people, just touched with Polynesian blood in a few localities, and speaking a Polynesian language slightly mongolized.

A list of Enganese words is given in the article I have mentioned. The enunciation is curiously different from the Malay, and is difficult to follow, the vowels appearing to be uttered in several different tones, as in Shan or Chinese. As in Nicobarese, euphony is spoilt by the excessive number of imperfect k's and ng's (the French *n nasal*). These consonants, which rarely occur in Polynesian languages, except the Malay, are generally absent in the personal and place-names, which usually have a strikingly Polynesian air. I spent much of my time at Kayapu, where Pahakela (the *p* is always pronounced halfway between a *p* and an *f*) was chief : the names would be natural in New Zealand or Hawaii.

There seem to be no indigenous mammals on the island except bats, wild pigs and a *Paradoxurus*. This absence of four-footed enemies may have been one cause of the excessive multiplication of birds. One sees more birds in a day in Engano, than in a month in Borneo or Sumatra, and coming from the latter island I was struck with their exceeding tameness. I saw four sorts of parrots and three of pigeons ; the latter are never out of sight, the former keep up a deafening noise all day. The species seem generally different from the Sumatran, and no doubt some are undescribed. I think an ornithologist could do good work in Engano.

I think I got nine or ten sorts of land shells of which the greater number must be new. My small collections of moths and beetles were sent to England. The striking features of the latter were the prevalence of *Elateridæ* and the extreme rarity of *Phyllophaga*. No *Cassida* was taken at all.

Frogs, toads, snakes and lizards all abounded, and it is evident that the island has been at one time connected with the mainland, especially as a true cyprinoid fish appears to occur in the streams of the highlands. The coral crust does not imply the entire submergence of the island, while the number of peculiar butterflies shows its long isolation.

The forest is finest on the western coast, where the coral crust is thin or broken. The vegetation is there nearly as grand as on the mountain slopes of Sumatra. This side of the island is evidently very rainy. Even the comparatively barren eastern coast seems well suited to some plants, and in some places the pandani, which do not form thickets by themselves, as in the Nicobars, but grow among other trees, reach a surprising height, one I saw being fully a hundred feet high.

I caught fifty-eight kinds of butterflies, and saw two or three more on the day I landed. Three days of heavy rain followed, after which insects were scarce, and I obtained good sets of only a few species. The heavy forests of the interior scarcely produced anything but *Cyrestis periander*, *Mycalesis mineus*, *Amathusia amythaon*, *Eoöxylides tharis*, and *Paragerydus unicolor*. Most of the peculiar *Danaidæ* occurred only close to the shore. Examination of the inland forest at another season may produce true endemic species, such as have been found in Nias. Should any future collector visit the island, I recommend Bua-bua, near the western coast, as the best collecting ground, and April or May as the best season. My own visit was in September, 1890, and lasted three weeks.

The species are mostly local forms of widely spread species. I have felt obliged to give names to thirteen of them, including nearly all of the *Danaidæ*, and these should in most cases rather be called subspecies than species, but as I always give the name of the parent form, this ought to cause no difficulty. My types will be placed in the collection of the Hon. L. W. Rothschild. I have endeavoured to make in the text such comparisons as I could with the species taken by Herr Kheil in Nias, but I find it difficult to sum up the results.

While I have a few criticisms to make on Mr. Moore's well-known monograph of the *Danaidæ*,* I do not wish to appear ungrateful for the help he has there given to all students of this group. Though some have objected, he seems to have done right in giving names to the numerous subdivisions he has made. At the same time, most of them seem scarcely worthy of a higher rank than that of subgenera, and some are founded on minute and unreliable characters.† His classification is dubious, and some of his species worse than dubious. But in any case he has let a flood of light into one of the darkest corners of entomology, and all future work in this family must start from his as a base.

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* In the Proceedings of the Zoological Society for 1883.

† Such as the rudimentary recurrent vein in the cell of the forewing, a feature

I do not see any reason for accepting his term *Euplœinæ*, instead of the commonly received *Danaidæ* or *Danainæ*. The name *Danaus* necessarily falls, having been used for *Pieridæ*. But *Danaida* and *Danais* are both older than *Limnas*, and there can be no similar objection to them. Mr. Scudder, with his usual conscientiousness, has adopted *Danaida*, the earlier of the two names. But I think his verdict may be reasonably traversed on the ground of the irregular formation of *Danaida* and the universal use of *Danais*. It can hardly be seriously maintained that the latter name cannot be used on account of its resemblance to *Danaus*. So the group obviously remains the *Danaidæ* (or *Danainæ*), the genus *Danais*, and its type *plexippus*,* *Anosia* falling before it.

Mr. Moore's primary division of the family is into two groups, the *Limnaina*, including *Danais* and *Hestia*, and the *Euplœina* including

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which seems to vary in different specimens. *Mahintha* was founded on a local race of *Euplœa core*. *E. simulatrix* was placed first in *Vadebra* (*Crastia*) and then in *Menama*, though it obviously cannot come into either, or into the "section" in which both are placed.

* The name now applied to a butterfly known to every American farmer as *archippus*. These useless changes of name now so much insisted on, especially by American naturalists, are bringing scientific nomenclature into well-deserved disrepute among all outsiders. Surely there ought to be a statute of limitations; security that some one, turning over musty volumes of pre-scientific times, shall not make all existing works obsolete. At present we stop short at Linnæus. This is purely an arbitrary line. The next generation will perhaps go back to Ray and Swammerdam; with the aid of a little zeal and imagination quite a number of generic names can be found in their books. The first false step taken was the acceptation of Hübner's childish work as an authority. There was *Adolias*, a genus described by such a profound and discriminating writer as Boisduval, and accepted by all naturalists. Finally, some one discovered that a few years before the date of Boisduval's great work, Hübner, a contemporary, not of Linnæus, but of Latreille, had invented a genus *Euthalia*, described merely as "dark with white and red spots," containing *lubentina* and *adonia*, and placed in an imaginary family, prettily named *die Fröhliche* or The Joyful Ones. *E. aconthea*, and *E. evelina* (the latter along with an African *Aterica* and a European *Apatura*) were at the same time placed in different genera of another imaginary family called *die Muntere*, or The Lively Ones. And so, to the confusion of naturalists all over the world, *Euthalia* took the place of *Adolias*. Lepidopterists have yielded to an infinity of similar changes. It remains to be seen whether coleopterists will be equally submissive. Mr. Crotch now proposes to alter the names of a number of the best-known genera of beetles, names consecrated by a century of use. I cannot help wishing his opponents all success in the struggle against *ce malencontreux droit de priorité*, as M. Deyrolle calls it.

Euplœa and *Hamadryas*. The only difference mentioned, is that in the former there is usually a precostal cell in the hindwing, wanting in the latter. Now, it is true, an obscure rudiment of one is present in some species, but better distinctions can easily be found. *Hamadryas* probably does not belong to this family, but to the *Neotropidæ*.* *Hestia* has undoubted affinities with *Danais* in its neuration and markings, but in its anal tufts, its egg, and the structure of its feet, it is more like *Euplœa*, while its antennæ show how remote it is from either. So I would suggest the following classification instead of Mr. Moore's.

Tarsi with large paronychia and pulvillus. Anal tufts two or four.
Antennæ filiform, HESTIA *Group*.
„ *clavate*, EUPLŒA *Group*.
Tarsi with rudimentary paronychia and pulvillus†. *Anal tufts two.*
DANAIS *Group*.

Mr. Butler, to whom we owe the classification of the *Euplœas* by the male marks, accepted, as all previous writers had done, Cramer's *core* as the type of the genus, and formed the genus *Macroplœa*, with *elisa* as its type, applying Hübner's name *Crastia* to *climena* and its allies. This arrangement has been generally adopted, and it is most unfortunate that Mr. Moore should alter all three names on what may be called archæological grounds. *Core* has been accepted for a century as the type of *Euplœa*, and although it would be more pedantically accurate to follow Fabricius rather than Cramer, it seems a pity to confine the use of *Euplœa* to two or three species (with their local forms) forming a small aberrant genus, now well-known as *Macroplœa*, while hundreds of species cluster around *core* as their natural type and centre. *Macroplœa* (Mr. Moore's *Euplœa*) is a true genus, and must be ultimately recognized as such. But unless we accept M. Moore's little groups as genera, we must find some general name for the large mass of species remaining. It is unlikely that naturalists will consent to call them all *Crastia*. Surely they had better keep the name of *Euplœa* as before, with *Crastia* (= *Vadebra*,* Moore) as a subgenus under it.

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* I do not know whether Schatz's name can stand, as it is not derived from that of any genus, and has no type. The name *Erycinidæ* has been dropped by some writers for this reason, the generic name *Erycina* having been superseded.

† The appendages of the last joint of the tarsi of butterflies are, 1st, the claws, 2nd, the paronychia, 3rd, the pulvillus with its shield. The *paronychia* are tactile organs, one on each side of the foot, slender and flexible (not jointed as some writers have said), covered with short sensitive hairs or *papillæ*. In most cases they are split into two long finger-like process, the longer following the course of the claws, the shorter curling round the edge of the pulvillus-sheath, obviously with the object of examining the surfaces touched by these two organs. The *pulvillus* is a soft, muscular projection, resembling an additional tarsal joint, but not armour-clad like the others. It is evidently intended to act as a buffer, to break the shock of alighting, and no doubt owes its name *pulvillus*, or cushion, to this function. Its lateral surface is sensitive, with papillæ like those on the paronychia. But its lower surface is covered with a round corneous plate, or shield, which no doubt acts as a *sucker*, flexible in life, slightly concave in the middle. This is easily detached in dried specimens.

Now in certain butterflies of aërial habits like *Danais*, the claws have been greatly lengthened, so that the pulvillus did not touch the surface on alighting. Thus losing all function, it has shrunk into a small, hard, inflexible mass. The paronychia have similarly lost their use, and remain in various stages of obsolescence. They are still distinct in *Ideopsis*, and retain their bifid shape, though too small to be of use.

As to the position of the family as a whole, I understand that Mr. Scudder now gives it a low one, below the *Apaturidæ*, *Nymphalidæ* and *Satyridæ*. Much, however, may be said in favour of retaining it at the head of butterflies. The shoulder plates are in most butterflies shaped more or less like a human foot as seen from the side, having a long posterior process. It is only in the *Danaidæ* and the *Acræidæ* that they are simply semicircular in shape (in the *Danaidæ* more than half a circle) without the posterior process. The process is also greatly reduced in *Cynthia* and *Cethosia*, the nearest genera of the *Apaturidæ*, while in the lower forms of the *Tetrapoda*, the plate greatly resembles that of other butterflies. The long claws of the *Danaidæ*, culminating in *Danais* with its aborted paronychia, may also show a higher development than other Tetrapoda. But they are also found in the Papilios, and seem to go along with a prolonged and aërial flight. The fore-feet of the male still retain the tarsus, which is lost in most *Neotropidæ* (*Ithomiadæ*), but it is less developed than in the *Morphidæ* and most other higher butterflies.

The striking feature of the *Danaidæ*, however, is the more perfect development of the fore-feet of the female into sensory organs much resembling the antennæ, but set with highly specialized tactile hairs or papillæ.† I have taken a good many notes on this subject, on which so far as I know nothing has yet been written, and when they are more complete, I hope to publish them. So far as examination has yet shown me, there seems to be a gradual development upwards from the *Morphidæ*, in which the joints are tapering, the last the slenderest, with a conspicuous pulvillus and rudimentary claws with their appertaining hairs. In the higher groups, these tarsi become less and less like a foot, and more and more like a palpus. The *Satyridæ* and *Nymphalidæ* are more developed in this respect than the *Morphidæ*, and the *Apaturidæ* much more. The *Neotropidæ* according to Mr. Godman have the fore-tarsi of the female not clavate, and hence probably less developed. In the *Danaidæ* and the nearest *Apaturidæ* (*Cethosia* and *Cynthia*), they attain their largest development. This can hardly be an organ of touch, because these feet are poorly provided with muscles, and are capable of but little movement. It may be an organ of hearing, but it is more likely one of smell, correlated with the scent-producing glands of the male. It is significant that in the *Neotropidæ*, where this foot is more normal, the male has no anal tufts.

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* Mr. Moore applied this name to two different genera of butterflies in the same issue of the Proceedings of the Zoological Society.

† These also occur in all Tetrapoda, and in some other groups, as the *Nemeobiadæ*, but are there few and small.

I think the special development of this organ, which is found in all Tetrapod butterflies, though but little specialized in the lowest, is an argument for the high rank of the *Danaidæ*. But I am aware that the feet of of butterflies often vary most irregularly, independently of the general organism. The aborted forefoot of the male shows some such inconsistencies, rudiments being, as Darwin has shown, eminently variable. *Melanitis* and *Bletogona* in the *Satyridæ*, many *Pieridæ*, and at least one genus of the *Lycænidæ* have the claws bifid. The number of joints in the forefeet of female Tetrapods also varies. And in *Pseudergolis*, a genus of the *Apaturidæ*, differing but little from its neighbours in other points, the fore-tarsi of the female, though small, are quite perfect, with claws, pulvillus and bifid paronychia. This fact would place it quite outside of the Tetrapod butterflies, near the *Nemeobiadæ*, if the feet offered really reliable characters.

The prehensors of the *Danaidæ* are chiefly remarkable for the aborted uncus and the broad flat clasps. They do not vary much in the different species; most in *Hestia* and some kinds of *Danais*. My notes are insufficient to permit me to generalize on the subject. It is remarkable that the only species in which they are really very aberrant is *Danais aglaioides*, where the clasps are prolonged downwards, and exposed to view even in dried specimens. This butterfly is closely allied to *D. aglaia*, differing chiefly in the shape of the wings, and they are found together over much of their range. It seems likely that in this case the prehensors have been strongly differentiated to prevent hybridism, and keep the species separate.*

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* This may also be the case with the genus *Lampides*, where a number of protected species, remarkably alike in colour and markings, have the prehensors extremely unlike, and so differently armed with hooks and pincers, that the union of different species would presumably bring about serious consequences. Great confusion has been caused here by the German lepidopterists, who have recently figured a great many species with very brief descriptions, and no account of the prehensors. The

The egg also varies little in the *Danaidæ*, and affords few characters for classification. It is slightly like that of *Libythea* (which more resembles that of the *Pieridæ*), and is nearly identical with that of the *Acræidæ*, and with those of *Cynthia* and *Cethosia*, the first genera of the *Apaturidæ*, which are again connected by several links with *Argynnis*, where the series seems to end. In the *Danaidæ* it is large, soft, cartridge-shaped, more than half again as high as wide, yellowish, or sometimes pearl-white. It has a variable number of upright ribs anastomosing near the apex (where the reticulations are more or less hexagonal over a varying extent of surface), and with horizontal cross-lines varying greatly in number and in distinctness, and generally hard to count. I append a list of species with the number of vertical ribs on the egg of each, and with that of the cross-lines in parenthesis, whenever I know it. The numbers always vary slightly in the same species, and that of the cross-lines can only be given approximately. The egg of *Nectaria* and *Macroplœa* I forgot to examine. That of *Hestia* is unlike the others in having the reticulations more or less hexagonal, the ribs being slightly zigzag. The figures support the idea that *Hestia* is nearer *Euplœa* than *Danais*. It will be observed that in *Danais* (including *Ideopsis* and *Radena*, which are practically identical) the cross-lines are usually more numerous than the ribs, while in *Hestia* and *Euplœa* they are fewer, *Stictoplœa* coming near *Hestia* in this respect, as well as in the anal tufts. The figures for *Danais chrysippus* and perhaps *limniace* and *tytia* are doubtful.

HESTIA *Group.*	*Hestia cadellii,*	21 (14).
	hadenii,	23 (14-15).
	lynceus,	21 (14).
EUPLŒA *Group.*	*Stictoplœa lacordairei,*	27 (13).
	Salpinx novaræ,	26.
	kollarii,	22-23 (20).
	splendens,	22 (18-19).
	Euplœa esperii,	26.
	camorta,	31.
	simulatrix,	30.
	core,	34 (23-25).
	midamus,	24-25 (20).
	alcathoë,	39 (26-27).
	rhadamanthus,	21-23 (15).
	pinwillii,	26 (18).
DANAIS *Group.*	*Danais genutia,*	32 (30).

revision of this genus, which is further complicated by the prevalence of local and seasonal forms, will prove a heavy task to future naturalists.

Danais hegesippus,	31-34 (29-30).
nesippus,	34.
chrysippus,	34 ("nearly 50" ?).
gautamoides,	23-24.
limniace,	25 (25).
septentrionis,	19-21 (30).
melaneus,	16-18 (27).
larissa,	20-21 (30).
tytia,	20-21 (38).
melanoleuca,	19 (22).
aglaia,	17 (26-27).
aglaioides,	15-16 (25).
Ideopsis daos,	15 (25).
Radena nicobarica,	16.
vulgaris,	14-16 (25).

Next comes the vexed question of scent-glands. I was so discouraged by the loss of all my notes on this and other structural matters in 1887, that I have taken but few since, so I cannot now speak with much authority on the subject.

It seems probable that there is a disagreeable odour in all *Danaidæ*, apart from that of the anal tufts and alar glands. Though infinitely less in strength than it is in the *Agaristidæ* and other moths, it is still quite perceptible on pinching some species, such as *Danais genutia*, *crocea* and *vulgaris* (which smells of sorrel). In others I cannot make it out at all. This smell is probably associated with a taste highly disagreeable to spiders, chickens, etc. The results of my experiments made some years ago in the Celebes, Java, etc., are now lost, but in the Malay Peninsula I lately made a few on spiders, with the following results. Except in the case of the first two species, they cannot be entirely trusted.

Species always rejected, *Danais genutia,*
Radena vulgaris,
Ornithoptera ruficollis,
(only two offered).

Species sometimes rejected, *Euplœa midamus ;*
,, *rhadamanthus,*
Neptis varmona,
Cethosia hypsina,
Loxura atymnus,
Lampides ælianus.

Species never rejected, *Neptis* sp.
Athyma sp. etc.

It is to be observed that the *Radenas* are perhaps the most perfectly protected of the *Danaidæ*, and yet they are not brightly coloured, they have no alar scent-glands, and the anal tufts are the smallest in the whole family, and give the least fragrance.

Apart from those producing the odour pervading the whole body, four different classes of scent-glands have been pointed out.

The first are the impressed silky streaks of altered scales on the forewings of some *Euplœas*, often called *brands*. Mr. Distant oddly enough calls these pseudo-scent-glands, taking the falsity of their claims for granted, while assuming to leave the question open. The marks in question seem to consist of scales only, and I have not yet observed any glands connected with them. Though not very conspicuous in some cases, they may be addressed to the eye of the female, and help her to recognize the male of her species. For odours vary but little in the *Euplœas*, and the amount of mimicry is so great that in most localities there are several species similarly coloured but bearing different sex marks. In any case these brands can hardly be protective, and the assumption by some writers that a species furnished with them is better protected, and more likely to be a mimicked than a mimicking form, is without foundation.

The variously-coloured velvety patches on the hindwing of *Trèpsichrois*, *Salpinx* etc., are no doubt true scent-organs. In the case of *Trepsichrois midamus* the odour is sometimes quite perceptible in the detached hindwing, while in *Salpinx* and *Calliplœa* it is apparently excited by friction against the forewing. In some cases, such as *Euplœa oceanis*, described below, the velvety area is on the underside of the forewing.

The "pouches" on the hind-wings of certain species of *Danais*, such as *D. limniace*, are probably true scent-organs, though neither Professor Wood-Mason, who has given them special attention, nor myself, have been able to detect any odour. He has kindly shown me a microscopic section of the pouch. The cavity is lined with a semicircle of long cylindrical cells radiating from it, their nuclei near their inner ends, the outer wall of the mass thick and chitinous, the inner membranous, with the attached scales aborted. According to Professor Wood-Mason, the odour-giving fluid is presumably manufactured in these cells, and not merely drawn from the body and stored in them. An account of these pouches, apparently made from the study of dried specimens, has appeared in the work on the "Duftapparate indo-australischer Schmetterlinge," by Dr. Erich Haase of Dresden.

Finally there are the abdominal tufts which we find in this family alone of all butterflies. They resemble those of the *Callidulidæ*, but are more specialized, though proportionately smaller than in these and many other moths.* They exist in a very rudimentary state in the female, and can as in the male be forced to the surface by the action of the fluids in the body. From some such small beginning, they have grown to their greatest development, several stages of the process remaining as fixed characters in the different genera. The smallest tufts occur in *Radena vulgaris;* they are much longer in *R. juventa.* The greatest development of simple tufts occurs perhaps in *Euplœa (Trepsichrois) midamus.* In all the species of the *Danais* group the tufts are simple and single, only in *Tirumala* the hairs are curled at the tips. They are also simple in the majority of the old genus *Euplœa*, and I limit the name to these. The gland in all these consists, when protruded, of a finger-like projection extending laterally on each side of the abdomen, and bent round forwards (*i. e.*, towards the head) in a semicircle, bearing long odoriferous hairs to the very tip.

But in the genus *Salpinx*, as limited by Mr. Butler (including Mr. Moore's *Salpinx, Isamia, Pademma, Satanga* and *Selinda*, but not apparently *Danisepa*), and also in his genus *Calliplœa*,† while the gland is similar (somewhat longer and more bent), the long hairs are gathered chiefly around its base, the outer part being naked, except at the extreme tip, where there is a brush of short, stiff bristles, sometimes coloured differently from the long basal hairs. This terminal brush is only seen when the gland is fully protruded. The development of this form from the first is obvious. This group is also large, but the number of species seems to me to have been greatly exaggerated.

In more advanced forms, a new gland, generally somewhat shorter than the other, has been pushed out from its hairy base on the anterior side. In this case both glands are covered with hair to the tip, the space between their bases being naked. This occurs in the genus *Hestia*, and apparently also in *Macroplœa* and *Stictoplœa*‡ as defined by Mr. Butler.

Finally in the single genus *Nectaria*, while the posterior tu remains unchanged, the anterior or last developed one is again absorbed, and is represented by a microscopic tuft at the base of the other. This can hardly be the incipient stage, as it is too small to be of any use, and the nature of its origin is obviously as given above. It hence appears that *Nectaria* has attained the furthest development in this regard, and may still with good reason be retained at the head of the *Danaidæ*, and of all butterflies.

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* In most moths these tufts are attached to the prehensors or clasping-organs of the male.

† Herr Georg Semper and Dr. Haase consider *Calliplœa* identical with *Euplœa* (*i. e.*, *Macroplœa*), but I cannot agree with them. *Calliplœa* scarcely differs from *Salpinx*.

‡ My drawings of the glands of *Macroplœa* and *Stictoplœa* were lost in 1887, and I have not examined those organs since. But my impression is that they are very similar to those of *Hestia*, though somewhat less developed.

The following scheme will serve to show the relations of the genera of this family. Mr. Moore's genera may be reduced to subgenera, though *Parantica* and perhaps one or two others may be retained.

- A. *Feet with well-developed paronychia and pulvillus.*
  - B. *Forewing with a prediscoidal cell.*
    - C. *Anal glands four, two aborted,* .... NECTARIA.
    - C. *Anal glands four, none aborted,* .... HESTIA.
  - B. *Forewing with no prediscoidal cell.*
    - C. *Glands four (?), none aborted.*
      - D. *Forewing of male with no brand,* ... MACROPLŒA.
      - D. *Forewing of male with two brands,* ... STICTOPLŒA.
    - C. *Glands two, tufts four,* .... SALPINX.[*]
    - C. *Glands two, tufts two,* .... EUPLŒA.
- A. *Feet with rudimentary paronychia and pulvillus.*
  - B. *Hindwing triangular, with scent-pouches,* ...... DANAIS.
  - B. *Hindwing triangular, without scent-pouches,* ... RADENA.
  - B. *Hindwing rounded, generally without scent-pouches,* .... IDEOPSIS.

There seem to be grounds for believing that the scent-tufts in the male serve three distinct purposes, 1st, to warn off enemies, 2nd, to attract the female by colour, 3rd, to attract her by odour.[†]

1st. The odours given forth are in some cases unpleasant. In *Danais limniace*, it is that of turmeric, and is downright disagreeable. Other species of *Danais* have the peculiar aromatic fragrance characteristic of so many protected Mediterranean plants. In the genus *Salpinx*, in which the tufts reach their greatest development in size, the odour, though exceedingly sweet, is almost overpowering. Now it may at first sight seem absurd to say that the scent of honey may protect an insect from its enemies. But we know this to be sometimes the case. The male of the singular Hesperian, *Calliana pieridoides* has assumed conspicuous white colours along with a delicious odour, the female remaining dark and odourless.[‡] The fine Malayan Morphid,

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[*] Including *Callipløa*.

[†] The odour is not always present, but comes and goes, whether by the exhaustion of the supply, or by the will of the insect, it would be interesting to learn. I have sometimes examined the tufts of several males one after the other, without detecting the perfume.

[‡] Mr. de Nicéville recently discovered the female, and it turned out to be dark, as I had predicted.

Melanocyma faunula, is saturated with sweet perfumes, and drifts feebly about the country, fearless of enemies. The fragrant butterflies of the genera *Stichophthalma* and *Tænaris*, though no doubt not so completely protected, are so conspicuously coloured and fly so feebly, that one cannot suppose them to be eaten by birds. The *Ornithopteras*, though I have shown by experiment that they are protected from some enemies, smell of nothing worse then petunias. I have heard that cattle will not touch peppermint or pennyroyal, though the scent of those plants is so pleasant to us. On the whole I do not doubt that slow-flying, brilliantly-coloured insects like *Trepsichrois* and *Salpinx* are more or less protected by their scent-tufts.

2nd. Colour in the tufts seems a later development than odour. In *Radena*, where they are least developed, the tufts are of very inconspicuous hues. In *Danais* they are usually not at all brilliant, though it must be admitted that the odours are also less developed in these. But in some species the hairs are curled,* and this may be an ornamental development. In the *Euplœas* the growth of colour and odour go on *pari passu*. The brilliant ochreous tufts of *Trepsichrois* contrast finely with the black and shining blue of the wings, and are visible from a long distance. This colour appears in a great many species. In *Salpinx* the tufts are still larger, and the small terminal pair are frequently coloured differently from the others. In *Hestia* the anterior tuft seems usually coloured otherwise than the posterior, though in *H. cadellii* they are both dull grey.

3rd. The great majority of the family smell of honey or of flowers—vanilla, tuberoses, jasmine, etc., and outside of the *Danais* group, the only aberrant perfume I can remember is that of wintergreen,† which is also found in butterflies of other families, and in Pyralid and Geometrid moths. But honey- and flower-like smells are the rule. This suggests the possibility that the odour-producing particles may not be manufactured by the insects, but be derived directly from the plants they frequent. At any rate the attractive scent must often be identical with that of the flowers on which they feed. So that it does not seem incredible that the female should sometimes be wooed under false pretences, and led to expect a dinner instead of a lover.

Male *Euplœas* often meet in great swarms, haunting some particular spot in the forest for many successive days, some perching on leaves and flowers, but most circling slowly around, many of them displaying their tufts, so that the air is noticeably permeated with their fragrance. Many different species meet on these occasions, as if recognizing the family relationship of all. The females may at the same time be lurking hard by in the jungle, though in smaller numbers, a few of them sometimes joining in the flight of the males. I have often observed males flying alone with expanded tufts, and I suppose they are trying to attract the female from a distance, appealing rather to her sense of smell than that of sight. In the presence of the female, the male keeps his tufts in continual action, and whether of dark or bright colours, they may well be as attractive to her eyes, as the plumes of the cock grouse or peacock are to his hens. The eyes of butterflies are so prominent, that though the female never faces the male, but keeps gliding on just before him in coy retreat, I cannot think that any grace of his escapes her notice. But her sight is probably not so strong as to recognize these ornaments at a great distance. So that the attractive colours are presumably intended to take effect at close quarters only, while with a favourable wind the odour is no doubt perceptible far away. I myself cannot generally make it out more than two or three feet away. But the forefeet of female *Danaidæ* seem to be developed into a powerful organ of smell, and even apart from this, that sense must be keen in all butterflies, since they are attracted from long distances by the scent of flowers. And few flowers are so fragrant as these insects.

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* This is also the case with a few *Euplœas*, such as *alcathoë*.

† The same smell is given out by several tropical plants.

List of Enganese Butterflies.

Family DANAIDÆ.

1. NECTARIA LEUCONOË, Erichson, var. ENGANIA. This slight variety seems darker than the typical *N. leuconoë*, as figured by Doubleday, just as *N. clara* (as figured by Herr Semper) is much lighter. The base is but slightly touched with creamy, and more so in the female than in the male. The dark lines in the cell of the forewing are distinct, the black transverse area there narrower and more quadrate than in *leuconoë*, the discal dark markings are more connected, and those on the hindwing are more triangular, the wedge-shaped white spot near the lower angle of the forewing is distinct, and in general the markings are very clearly cut and distinctly outlined. The male has two large whitish abdominal tufts, each with a minute rudiment of another near its outward base.

2. MACROPLŒA CORUS, Fabricius, var. MICRONESIA. Somewhat resembling *M. corus* (*elisa*), with the size and shape of *M. phœbus*. Male, forewing with the spots minute, one in the cell, seven in a bent discal series, and ten submarginal dots. Hindwing with two or three discal, and one or two subapical dots. *Below*, forewing with a dot in the cell, two large discal spots with a dot below them, two subapical dots, and

a submarginal row of thirteen dots. Hindwing with three discal dots subapically, and four or five submarginal ones. The single female has the spots still fewer and less conspicuous, the submarginal ones wanting except at the apex.

As I took only two or three specimens, I can hardly describe this form as a distiuct species. It seems greatly to resemble *M. semicirculus* from the Moluccas. The extreme smallness of the spots easily distinguishes it from *M. phæretena*, described by Herr Kheil from Nias. *M. phæretena* (the name was perhaps intended as an anagram of *phænarete*) seems to be simply the female of *M. phœbus*, which he also includes in his list of Nias butterflies.

3. SALPINX PHANE, n. sp. Male, above rich velvety blue, resplendent in some lights, the hindwing nearly equally brilliant, whereas in *S. novaræ* and *S. vestigiata* it is all brown. Forewing, with one costal and the usual interno-median pale blue spot, and a row of seven outer-discal ones, of which the first three are united, the third the largest. Hindwing generally with two subapical spots. *Below*, rich violet brown; the spots are sometimes wholly wanting in both sexes, but generally one or two remain subapically on the hindwing. The male before me has five subapical spots in two series on the forewing and four larger ones on the hindwing. The larger tufts are dark brown, the small terminal ones whitish. The female is less richly coloured, the hindwing being brown: there are two elongate blue spots in the interno-median space of the forewing above.

This is a local form of *S. leucostictos*, Gmelin, but it seems more distinct from the Javanese type than are either the Malaccan (*vestigiata*) or the Nicobarese (*novaræ*) forms.

4. EUPLŒA (TREPSICHROIS) MALAKONI, n. sp. Male like *E mulciber* but with the hindwing blue like the forewing, though less brilliant, whereas in the other species it is brown. The odoriferous patch on the hindwing occupies all the end of the cell, extending to the upper median vein. The pale blue spots of the forewing, though variable, are few and inconspicuous; in the specimen before me there are only nine in all, some very minute. The female varies greatly in the distinctness of the spots, but in all cases the forewing has no trace of blue, which distinguishes it from the other local forms of *E. midamus*. Tufts bright yellow.

5. EUPLŒA (CRASTIA*) ENGANENSIS, n. sp. It greatly resembles

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* Mr. Moore's *Vadebra*.

E. climena from the Moluccas, and is near *E. sepulchralis*, Butler, from Java, but with the forewing imperceptibly paler outwardly, while the hindwing is very distinctly so, both above and below. Both sexes are rich brown above, without any trace of blue; the female has a single whitish spot in the middle of the disc. *Below*, there are usually on the forewing, one large violet-white spot in the cell, two or three subapical dots, two submarginally in the median spaces; five discal ones, the lower two larger and quadrate, the middle one slender, the upper two usually minute. *Hindwing* with one spot in the cell, a semicircle of six beyond it, then a curved series of about eight, (those below the middle median vein minute or wanting), and four submarginal spots near the apex, occasionally five or six. Tufts bright ochre.

This common species outwardly resembles *Euplœa simulatrix*, Wood-Mason, from the Nicobars, which, however, has a large sex-mark, somewhat as in *Salpinx*, on the hindwing above. Mr. Moore placed this species first in *Vadebra* (*Crastia*) and then in *Menama*, where it certainly does not belong.

6. EUPLŒA (CRASTIA ?) OCEANIS, n. sp. Male. Above dark brown with dull bluish reflections in some lights, the margin not visibly paler. *Below* uniform dark violet-brown, the markings varying greatly, most of them elongate but small. Forewing with one spot in the cell and seven beyond it, the upper ones slender, sometimes minute; a line of five outer-discal spots, the upper ones frequently absent; the female has sometimes a sixth spot in the interno-median space, beyond the line of the others. Hindwing with a small spot in the cell, and a row of 6-7 larger ones beyond it, and then a very variable series of 5-10, all but the first (which is sometimes absent) forming nearly a straight line: beyond these there are generally a few submarginal dots, sometimes forming an irregular line of ten.

The female has an obscure whitish spot in the cell of the forewing above, and seven similar ones beyond it, the upper ones slender. Beyond this the outer discal spots are slightly indicated. Hindwing with the outer discal line of spots indicated in various degrees.

The form of the wing in this species is as in Mr. Moore's genus *Gamatoba*, but the sex-mark is peculiar. The female has an elongate white mark on the underside of the forewing, below the lower median vein. Both sexes have the hind margin broadly whitish and shining below the internal vein. In the male there is a slightly velvety grey-brown patch of altered scales forming an elongate, quadrate mass, from the internal vein nearly to the lower median, equally divided by the wrinkle representing the submedian vein.

This species can scarcely be included in any of Mr. Moore's subgenera, and I know no described form resembling it. It was unluckily out of season when I was in Engano, and I only got two or three in fair condition, the rest being worn and faded.

7. EUPLŒA PAHAKELA, n. sp. Male, above, forewing rich brown, not at all lighter outwardly; hindwing paler brown, slightly darkening near the margin; a single "brand" like that of *E. core;* no other markings above in either sex. *Below* there is a rounded violet white spot in the cell, and a larger pinkish one in the lower median space, one in the upper median space, and sometimes one in the space above. Hindwing with a small spot in the cell, and 3-5 minute ones beyond it. There are sometimes traces of obscure subapical and subanal dots. Tufts bright ochre. The female is very pale brown and remarkably translucent; it has a long white streak below the lower median vein on the forewing below.

This species seems to have no near allies except *E. camorta*, Moore, from the Nicobars, which obviously differs in the pale borders of the wings.

Besides the *Euplœas* mentioned, I believe I saw a species of *Calliplœa*, near *mazares*, flying at Kayapu on the day of my arrival.

The *Euplœas* of Nias, as described by Herr Kheil, differ greatly from those of Engano; there can hardly be more than one species (a *Salpinx*) common to both. I append the list.

Nias.	Engano.
Macroplœa phœbus.	*Macroplœa micronesia.*
,, *phœretena* (♀ of preceding?)	
Euplœa (*Tronga*) *niasica*	———
,, (*Trepsichrois*) *verhuelli.*	*Euplœa* (*Trepsichrois*) *malakoni.*
,, (*Penoa*) *menetriesii.*	———
———	*Euplœa* (*Crastia*) *enganensis.*
———	,, ,, *oceanis.*
———	,, *pahakela.*
Salpinx leucostictos (perhaps the same as *phane*).	*Salpinx phane.*
,, (*Isamia*) *lowii.*	———
,, ,, *staudingerii.*	———
,, (*Tiruna*) *ochsenheimeri.*	———
———	? *Salpinx* (*Calliplœa*) *sp.*

The absence of the true *Euplœa* (*Core* group) and of *Crastia* (*Climena* group) from Nias, and of *Tronga* and *Isamia* from Engano, are interesting.

8. DANAIS PIETERSII, n. sp. Pl. I, Fig. 1. Male and female, above black, forewing with the lower part of the cell, the basal part of the lower median, and the greater part of the interno-median space dull ferruginous, the veins black. Margin touched with white at intervals; a line of four submarginal white dots in the median spaces; another larger and diffused near the lower angle; an inner line of seven white marks, of which the pair in the upper median space is of some size, the other dots: a subapical band of six widely-separated diffused whitish spots from the costa, the lower two largest; below these two obscure spots in the upper median space. *Hindwing* black, a large, pale ferruginous area in the cell, and others in the submedian and internal spaces extending three-fourths towards the margin; shorter, slender ferruginous streaks in the other discal spaces: two lines of submarginal whitish dots mostly obsolete, more distinct in the median spaces; cilia alternately black and white. *Below*, similarly marked but with the spots more distinct and numerous and violet-white instead of whitish; the lower part of the forewing ferruginous, the apex, as well as the outer part of the hindwing, suffused, with dull, dark reddish, which takes the place of the black. *Hindwing*, with pale ferruginous areas in all the spaces, most of them bordered with silvery white, the veins dark; the two submarginal series of the white spots distinct and complete. In some specimens the cell is nearly white, the inner ferruginous area evanescent.

I am not able to compare this species with *D. eurydice* from Nias, but judging from the forms with which Mr. Butler compares it, that species is without the ferruginous areas on the hindwing above.

I name this for my kind friend Mijnheer Pieters, Controleur of Kroë in Sumatra. It is a common and conspicuous species in Engano, whereas Herr Kheil describes *D. eurydice* as rare in Nias.

9. DANAIS (BAHORA) CHRYSEA, n. sp. Pl. I, Fig. 3. A local form of *D. philomela* from Java, differing in the subapical spots being more elongate, and in all the markings of the forewing being yellow except the two outer series, the yellow area of the cell heavily clouded with black scales except at its lower angle, in this resembling *D. crocea*. The interno-median yellow area shows is divided by a line of black scales in the middle, the quadrate discal spots are partly joined, as in *crocea*. Hindwing marked as in *crocea* and coloured as in *philomela*. The wings are very long and narrow. The female has the yellow area more restricted, all the spots larger and more conspicuous.

I think I saw *Parantica aglaia*, or its representative, on the day of my arrival at Engano, but no specimens were taken.

10. RADENA LONGA, n. sp. Pl. I, Fig. 2. A local form of the Javanese *R. juventa.* Forewing very long, falcate, the white markings mostly elongate and reduced, cell of forewing with the basal mark slender, clavate at tip, the outer one small with the upper streak absent, the discal spots beyond the cell much reduced. Hindwing, with the white area in the cell broken by two dark lines, the upper wide, the lower slender, not quite continuous; all the discal spots beyond the cell slender and elongate.

11. RADENA MACRA, n. sp. Pl. I, Fig. 4. A local form of *R. vulgaris,* the forewing elongate (but shorter than in *R. longa*), falcate, cell with the basal mark bifid, the upper streak slender, not so long as the lower, the outer spot narrow at its upper end, with a minute spot adjoining it above, and without the slender prolongation present in *R. vulgaris;* the three spots beyond the cell greatly, and all the others more or less reduced in size. *Hindwing* with all the spots reduced, that in the cell simply bifid, without any spot in the bifurcation (such as occurs in *R. vulgaris*). The submarginal dots are wanting on the apex of the forewing above and below.

These two *Radenas* are about equally common, and are found together. In the island of Sembawa, east of Java, two *Radenas* also occur, but in this case the *juventa* form is restricted to higher altitudes, though there is a zone in which both are found. These facts surprised me as I had supposed *juventa*, like *vulgaris*, to be simply a local form of *R. similis.*

The anal tufts of *R. vulgaris* and *macra* are shorter than in any other Danaid, the hairs white at the base and grey outwardly. In *R. juventa* and *longa*, they are nearly twice as long and grey throughout.

All the Enganese species of *Danais* are distinguished by their elongate form. This is also the case with several groups of butterflies in the Celebes, as shown by Mr. Wallace.

Family SATYRIDÆ.

12. LETHE EUROPA, Fab. scarce.

13. MELANITIS LEDA, Linn. (*ismene*). My specimens were dark and nearly unmarked above, but of the usual shape. Both the ocellate and the non-ocellate forms were taken.

14. MYCALESIS MINEUS, Linn. Common.

Family ELYMNIADÆ.

15. ELYMNIAS DOLOROSA, Butler, var. ENGANICA. A local form of

Elymnias panthera, Java, resembling *dolorosa*, as described by Mr. Butler from Nias. The forewing, however, is scarcely paler outwardly, its lower angle generally suffused with reddish; the ocelli of the hindwing are placed in diffused pale spots. Underside with two or three minute ocelli on the forewing, and six on the hindwing the first nearly all white, the others blue with the outer end dark and the pupil white. The outer part of the wing is but slightly paler than the inner, and is not "stone yellow striated with blackish" as in *dolorosa*, but pale grey-brown with red striæ similar to those of the base. *E. dolorosa* has the hindwing more strongly dentate than in *panthera*, with a decided tail, but in the Enganese form the tail is much less distinct than in *panthera*. I took only females. The sex of the type of *dolorosa* is not stated.

Family MORPHIDÆ.

16. **AMATHUSIA AMYTHAON**, Doubleday, var. **INSULARIS**. Above black, the disc glossed with blue in some lights up to the border of the hindwing, but not apically on the forewing, the marginal line white. The lilac band is somewhat intermediate between that of *A. portheus*, or *dilucida*, and that of *A. westwoodii*, tapering less than in the latter, extending down to the internal, and up to the upper median vein near the outer margin, very broad costally. *Below*, the extensive space beyond the middle striga of the hindwing almost to the submarginal line is dusky in both sexes, without the lilac gloss of the rest. On the forewing there is a smaller dusky patch chiefly costal, beyond the fifth striga. These dark spaces are scarcely visible in the allied forms. The underside seems generally darker than in *westwoodii*, the ocelli have broader dark borders, the tails are much broader and more marked with white than in any other variety; the anal black spots are touched with blue in both sexes.

The ochreous band of the female is narrow, bifid near its lower end, deeply incised outwardly along the middle median vein and partly enclosing a dark spot in its inner margin above the same vein.

One of the numerous local forms of *Amathusia amythaon*, which are by some held as species. I am unluckily unable to compare it with Felder's Javanese varieties. It differs from *portheus* and *dilucida* in the broad tails and narrower blue band. It is like Westwood's *amythaon* (now called *westwoodii*), of uncertain habitat, but the band is less tapering, broader outwardly, the tails much broader, and the outer margin of the forewing convex instead of concave.

Family APATURIDÆ.

17. **CUPHA ERYMANTHIS**, Drury.

18. Atella alcippe, Cramer. The specimens are quite normal. Herr Kheil mentions *Atella phalanta*, and not *alcippe*, as occurring in Nias, possibly a mistake.

19. Cyrestis periander, Fabr. Resembles the Malaccan form (*themire*, Honrath), but still darker, much darker than the Tenasserim one, which is perhaps a distinct variety. I have not seen the Javanese form, but if Horsfield's drawing is correct, and the insect has only the single space between the two outermost ochreous bands white, *themire* may be considered a distinct species.

A common species in the high forest.

20. Precis ida, Cramer. Only one taken.

21. Hypolimnas bolina, Linn. The male is normal, the female infinitely variable. Occasionally it is not much unlike the male. Usually the bluish band across the forewing is obscure and there are traces of a reddish band from the disc of the forewing across the hindwing, with white discal spots beyond it. The white band across the forewing below is present or absent. Sometimes this form resembles *Danais pietersii* when flying. Mr. Woodford has given an interesting account of the variability of the female of this butterfly in the Solomon Islands.

22. Hypolimnas anomala, Wallace. My single male, taken at Malakoni, has only the costa and outer margin of the forewing purplish, with an outer-discal line of white spots on both wings, a submarginal line, and a few discal streaks. The hindwing has no white on the disc. No doubt the species is as variable in Engano as elsewhere.

23. Doleschallia niasica, Butler. I took two or three males which may be conspecific with the female described as *niasica*. They are much darker than males of *D. bisaltide*, the apex of the hindwing strongly suffused with black. Herr Kheil gives both *niasica* and *bisaltide* from Nias, apparently considering them distinct, but it is unlikely that two varieties so closely allied can be found together. I have recently taken typical *Doleschallia pratipa* and typical *polibete* in the same piece of jungle in Western Siam, but this is a case of two local forms overlapping at the limit of their ranges. The same is true of *Parthenos lilacinus* and *gambrisius* from Karenni to Lower Siam.

Family Nymphalidæ.

24. Neptis soma, Moore, var. meridiei. Smaller than the Indian variety, and darker below, the markings of the upperside somewhat smaller and less fuliginous.

25. NEPTIS OMBALATA, Kheil, var. ENGANO. Like the Nias form described by Herr Kheil, but on the upperside the subapical white spots are smaller and better separated, the two lines of submarginal lunules distinct, and the upper white band of the hindwing much narrower and more broken. The colour of the underside is a rich red-brown, and the black borders of the white bands are very conspicuous.

Family LYCÆNIDÆ.

Subfamily Aphnæinæ.

26. HYPOLYCÆNA THECLOIDES, Felder. This butterfly occurs locally in the Nicobars and the Malay Peninsula, and seems to feed on some shore-plant. It seemed scarce in Engano.

27. EOÖXYLIDES THARIS, Hübner. Common in the forests of the interior. The specimens are smaller than Sumatran ones, with the inner black fascia of the underside obsolescent.

28. BINDAHARA SUGRIVA, Horsf. Only two males taken, both quite normal. Herr Kheil mentions *B. phocides* in his Nias list, probably by mistake. I have taken *sugriva* in Great and Kar Nicobar, and again in Java.

Subfamily Deudoriginæ.

29. DEUDORIX EPIARBAS, Moore. The cell of the forewing is touched with red in the female.

Subfamily Lycæninæ.

30. NACADUBA ARDATES, Moore. Common.

31. NACADUBA VIOLA, Moore. Only one or two seen.

32. NACADUBA PROMINENS, Moore. Scarce.

33. NACADUBA MACROPHTHALMA, Felder. Scarce. None of these species are mentioned as occurring in Nias, but Herr Kheil's *Plebeius kupu* is apparently the female of *N. viola*.

34. CATOCHRYSOPS STRABO, Fab., var. LITHARGYRIA. I think the true *strabo* was also seen, and no doubt *C. pandava* and *cneius* also occur. These species all seem to feed on a leguminous plant growing on the sea-beach, and are found on many small islands. *Catochrysops pandava* is per-

haps the commonest butterfly of the Nicobars. Herr Kheil mentions only *C. strabo* and *cneius* from Nias, and also *C. kandarpa* (=*strabo*).

35. EVERES PARRHASIUS, Fab., (stated by Mr. de Nicéville to be the same as the European *argiades*). Only one or two seen. This is Herr Kheil's *Plebeius polysperchinus.*

36. LAMPIDES BOCHUS, Cramer, (*Jamides bochus*). My specimens were identical with Indian ones. The species seems to vary but little throughout its range. The Nicobar form seems perfectly distinct, and should stand as *L. nicobaricus*, Wood-Mason and de Nicéville. Herr Kheil's *Plebeius siraha*, from Nias, is apparently the same as *L. bochus*, but why he should compare it with *Plebeius balliston* (*Lycænæsthes bengalensis*) I do not know.

37. LAMPIDES SUBDITUS, var. TELANJANG. Female. Above, with the inner border of the black outer area excised by an entering angle. Hindwing with the outer bluish rings bounded inwardly by a broad dark band which is suffused anally with reddish. Below, the submarginal pair of fasciæ diffused and lunular. Hindwing with the orange forming a large area discally, extending above the radial vein and to the submedian, only three of the black spots complete, the inner zigzag line obsolescent.

Only a single female taken, but *subditus* is so different from other species of *Lampides*, and this form is so distinct from *subditus*, that I have thought best to name it.

38. LAMPIDES ELPIDION, n. sp. A local form of *Lampides elpis*, the dark white-bordered submarginal spots of the hindwing separated from the basal blue by a broad unbroken dark wavy band: forewing with the blue pale and milky, the outer dark margin rather broad, the veins edged slenderly with black at the apex. Below the ground-colour is uniform pale reddish-brown, as in the dry season form of *elpis*. Prehensors as in *elpis*. I have compared this butterfly with a long series of Indian and with four Javanese males, and it seems a good local race, easily distinguished. It is very much larger than Herr Kheil's *Plebeius talinga*, which has the black border of the forewing much broader, and the inner band of the hindwing wanting.

39. LAMPIDES CELÆNO, Cramer. I identify this species with some doubt; a small pale-blue form, quite common along the shore. Another *Lampides*, which I have not been able to place, is pale grey above, with the border rather narrow on the forewing and reduced to a thread on the hindwing.

Herr Kheil describes a *Cyaniris* from Nias, *puspinus*, dubiously distinct from *C. puspa*. *Zizera karsandra* certainly occurs in Engano, but I do not seem to have taken it. Herr Kheil gives it in his Nias list under the name of *Plebeius lysimon*.

40. PITHECOPS HYLAX, Fab. Scarce.

*Subfamily Gerydinæ.**

41. PARAGERYDUS UNICOLOR, Felder, (*horsfieldii*, Moore). The identity of *horsfieldii* and *unicolor* seems generally accepted by the German naturalists, and Mr. de Nicéville, who has examined Felder's types (three females) of *unicolor* at Vienna, has come to the same conclusion.

Paragerydus certainly does differ considerably in aspect from *Allotinus*. I think it may be kept distinct from it for the present, on account of the approximate second and third subcostal branches in the forewing of the male.

Family PIERIDÆ.

42. TERIAS HARINA, Horsf. Only one taken. Herr Kheil does not record it from Nias.

43. TERIAS HECABE, Linn.

44. TERIAS SARI, Horsf. Taken only on the hills.

45. APPIAS HIPPO, Cramer. Only females taken. It may be the Javanese *Appias lyncida*, and not *hippo*.

46. HUPHINA ETHEL, n. sp. Male, above white, all the veins, including the internal and medians, black, and bordered with diffused black scales, the cell and the upper median vein heavily bordered with black, the costa tinged with lemon. Outer border rather widely and equally black, a dark, diffused outer-discal band parallel with the margin as far as the internal vein, cutting off seven submarginal spots, all white except the first, which is bright yellow, slender, the last large and out-

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* In the 1889 volume of this Journal, by an unfortunate blunder I described the fore tarsi of the *Gerydinæ* as like the middle and hind ones, in spite of my numerous drawings showing the contrary. I also gave Herr Kheil's *Allotinus aphocha* as equivalent to *horsfieldii*. *A. aphocha* may be distinct, though badly described, and figured only on the underside, where it is identical with *horsfieldii*. I now doubt if my proposed genus *Malais* is distinct from *Logania*, though a Bornean form resembling *L. sriwa* does have the tibiæ short and thick.

wardly incised. *Hindwing*, rich ochreous yellow, (without any orange tinge) from the first subcostal vein to the hind margin; the outer border rather widely black (but not subanally), the outer part of the veins, except the submedian and especially the subcostals and radial, also black, bordered with diffused scales. *Below*, the white area is reduced on the forewing, the upper submarginal spots united in a large triangular bright yellow mass, only the lower two white, that above the upper median vein obsolescent. *Hindwing* lemon yellow, ochreous yellow on the extreme anal margin, with greenish areas above and below the cell, especially around the subcostal veins; the dark brown border very wide, attaining the cell, enclosing six yellow spots, all large except the fourth which is obsolescent, the first three more or less united.

The absence of all orange on the wings, the submarginal band of the forewing, the veins outlined with black on both wings, the very broad marginal dark band of the hindwing below, and the large extent of the yellow area, tinged with greenish below, easily distinguish this peculiar species from *Huphina lea* and *judith*.

Only one male, taken at Bua Bua.

Family PAPILIONIDÆ.

47. ORNITHOPTERA NEREIS, n. sp. A local form of *O. pompeius*, Cramer. Male. Above, black, the cell immaculate, the veins of the disc black, bordered with rather conspicuous whitish rays. *Hindwing* golden yellow, bordered with a deeply scalloped black band, which is only about $\frac{1}{10}$ of an inch wide at the ends of the veins, the base black above the middle of the costal space, including the root of the cell; two (in one specimen five) black discal spots subanally in the gold. *Below*, the white streaks near the veins are more continuous, and the end of the cell is slightly touched with whitish; a little red at the base of the wings.

Female, with the outer third of the cell entirely dull whitish, the whitish streaks between the veins coalescing, and extending nearly to the outer margins, the black rays in the middle of the spaces not nearly reaching the cell; hindwing very dull golden, the border wide, the discal spots coalescing widely with each other and with the outer black band, so as to enclose small yellowish lanceolate spots in pairs divided by the veins. *Below*, the hindwing is dull pale whitish-yellow, without any golden tint; this area extends only to the upper subcostal vein and occupies two-thirds of the cell. Several males and two females were taken, but one of the latter was unluckily destroyed, and the other is worn.

This species seems nearest the South Indian *Ornithoptera minos*.

Herr Kheil calls the Nias form *O. amphrysus*, Cramer, but it seems unlikely that a Javan species should occur in Nias and not in Engano. *O. nereis* obviously differs from *amphrysus* in the absence of the yellow band across the forewing of the male. The opaque whitish-yellow of the underside of the female is a striking character, and distinguishes it from a Philippine form, which otherwise resembles it considerably, especially in the male sex.

48. PAPILIO (MENELAIDES) ARISTOLOCHIÆ, Fab. Only one specimen taken; it was quite small. The species seems wanting on the opposite coast of Sumatra, being apparently replaced by *Papilio antiphus.*

49. PAPILIO (ILIADES) OCEANI, n. sp. A local form of *Papilio memnon*, from Java. Male, above like *memnon*, but the lines of luteous scales on the forewing are nearly obsolete (slightly visible near the apex), and those of blue scales on the hindwing less conspicuous, and not nearly reaching the cell. *Below*, the red basal areas are wholly wanting, and the outer grey area much narrower, not at all enclosing the series of large black spots.

Female, forewing above heavily marked with pale luteous bands bordering the dark veins over the whole disc, entering the upper end of the cell, black rays in the middle of the spaces, the apex darker. Hindwing similar but with the luteous bands less conspicuous, enclosing a series of large black spots. Below, the red basal spots are present, but very small, the grey border slightly broader than in the male.

The absence of the red basal spots above and below in the male, above in the female, the obsolete markings of the upperside of the male, and the narrow band of the hindwing below in both sexes, easily distinguish this species from its allies.

Only one male and one female taken.

50. PAPILIO (CHARUS) HELENUS, Linn. var. ENGANIUS. The lines of luteous scales are conspicuous above and below, more or less whitish near the lower angle of the forewing; the red lunules of the upperside are absent, except the anal one, which is obscure. *Below*, the white area is large, the marginal white lunules are distinct, the submarginal orange ones small and obscure, wanting in the lower radial and upper median spaces, giving the insect somewhat the appearance of *Papilio prexaspes;* the female has a diffused white spot on each side of the radial vein.

51. PAPILIO (ZETIDES) AGAMEMNON, Linn. One tattered male, Bua Bua.

52. PAPILIO (ZETIDES) SARPEDON, Linn.

Family HESPERIADÆ.

53. **HASORA BADRA**, Moore. Two males and a female taken, normal.

54. **PADRAONA PALMARUM**, Moore, var. **KAYAPU**. The black area beyond and below the cell of the forewing is nearly obsolete, the yellow band of the hindwing very wide. This is perhaps a distinct species, but as only one male was taken, I cannot be sure.

55. **CHAPRA MATHIAS**, Fab.

56. **UDASPES FOLUS**, Cram.

57. **HIDARI IRAVA**, Moore. One male.

58. **TAGIADES ATTICUS**, Fab. The two hyaline spots below the three subapical ones are absent in the male, the two at the end of the cell are joined in the female. The white area of the hindwing is very large in both sexes, extending to the outer margin, where there are three black spots.

EXPLANATION OF PLATE I.

Fig. 1. Danais pietersii, n. sp.
" 2. Radena longa, n. sp.
" 3. Danais chrysea, n. sp.
" 4. Radena macra, n. sp.
Figs. 5-8 refer to Mr. Doherty's other paper.

III.—*New and Rare Indian* Lycænidæ.—*By* WILLIAM DOHERTY, *Cincinnati, U. S. A. Communicated by the* NATURAL HISTORY SECRETARY.

[Received 9th March 1891:—Read 6th May, 1891.]

(With Plate I, Figs. 5-8.)

Family LYCÆNIDÆ.

Subfamily *THECLINÆ*.

1. **ARHOPALA KHAMTI**, n. sp. Pl. I, Fig. 5.

Near *A. aënea*, Hew., differing in the dark, dull indigo-blue of the upperside, and the darker shade of the underside, with the terminal cell-spot remote from that in the lower median space of the forewing; hindwing with a large subanal ocellus bordered with metallic green, which extends to the lower median vein; a dark spot edged with whitish in the lower median space. Lobe and tail large.

Margherita, Upper Assam.

2. FLOS AHAMUS, n. sp. Pl. I, Fig. 6.

Female, like *Flos asoka*, but with the blue of the upperside pale, slightly violescent outwardly, not reaching up to the upper radial vein. Below, forewing with the transverse fasciæ much duller, and more regular, those in the interno-median space of the forewing obscure. Hindwing with the pale basal stripe absent, the base all dark, touched with scarlet costally; the lower half of the wing very dark, especially subabdominally, the markings there obscured; beyond the dark base there is a broad lilac area transversely from the costa to the hind-margin, containing a sinuous irregular band from the costa to the median vein, continued by a small separate spot in the interno-median space; an obscure ocellus in the lower median space submarginally, no other metallic markings. The species also resembles the Himalayan form of *Flos fulgidus*, Hew., but obviously differs in the colour of the upperside; and on the underside in the whitish spot at the end of the cell of the forewing, which is narrow and conspicuous, (broad and dull in *fulgidus*); the lower part of the hindwing is much darker, and the pale costal band absent.

Margherita, Upper Assam.

3. ACESINA ZEPHYRETTA, n. sp.

Male, above dark brown, a small diffused light blue area occupying less than a sixth of the forewing, including part of the cell, the interno-median and the lower median space, extending just above the middle median vein, the veins dark; hindwing unmarked, the cilia whitish, especially apically. Below brown, slightly glossed with violet, except the spots, which are darker and encircled by broad whitish rings. There is no costal white spot on the hindwing, but the apex is chiefly whitish, the disc irrorated with whitish scales, the ocelli obsolescent.

This species, in which the male resembles a female, is obviously distinct, and seems to connect *A. paraganesa* with the other species of *Acesina*.

Margherita, Upper Assam.

4. ACESINA ARIEL, n. sp.

Male, above violet-blue (dull in some lights) over half of the hindwing, and rather more than half of the forewing, the blue areas rounded. Underside uniform brown, strongly glossed with violet, not irrorated with whitish scales, the markings annular, scarcely darker than the ground-colour, with slender, pale violet-whitish rings; no costal white patch on the hindwing, the apex not whitish; three distinct subanal ocelli with metallic bluish-green irides. The violet hue of the upperside distinguishes it from *A. ammon* and *ammonides*, as well as the entire absence of the costal white patch on the hindwing below.

Margherita, Upper Assam.

5. ACESINA AMMONIDES, n. sp. (= *ammon*, mihi, nec Hewitson).

The Tenasserim form of *A. ammon*, which I have now been able to compare with a specimen from Pahang (Malay Peninsula) kindly lent me by Mr. de Nicéville, and one from Perak, taken by myself, seems a good local race, which I distinguish by the above name. In *A. ammon* the blue is slightly tinged with violet (but much less than in *A. ariel*), and occupies less than half of the forewing and hardly more than a quarter of the hindwing. In *ammonides*, the blue is more azure in tint, extends well beyond the cell all around it, and occupies half of the forewing and half of the hindwing. Below, in *ammon* there is only the conspicuous white costal mark on the hindwing. In *ammonides*, the apices of both wings, especially the hindwing, are strongly suffused with whitish, and there are whitish scales abdominally on the hindwing, and a quadrate discal white spot between the lower two median veins. In one specimen of *ammonides*, the three minute ocelli of the hindwing are touched with metallic gold; *ammon* is without metallic scales.

Tenasserim valley.

Besides those above mentioned, I took the following species of this subfamily at Margherita, Upper Assam. *Zephyrus distortus* (*Zinaspa distorta*, de Nicéville), *Flos moellerii*, *Darasana perimuta* and *paramuta*, *Arhopala teesta*, *singla*, *centaurus*, *amantes*, *rama*, *anarte*, *belphœbe*, *bazalus* and *camdeo*.

Subfamily *APHNÆINÆ*.

6. DRINA MANEIA, Hew.

The veins of the forewing are marked with raised lines of light-brown scales in the blue area, somewhat as in *Papilio ganesa* or *Argynnis childrenii*. The veins so marked are the three medians, the lower radial and the submedian, besides a line in the interno-median space, and two terminally in the cell. These are presumably scent-glands.

The venation agrees well with that of *Drina donina*, the type of the genus; so that Mr. de Nicéville, who had never seen the species, showed some acuteness in placing it here, in spite of its wholly different appearance.

Rare at Padang Rengas, Perak.

Genus THRIX, novum.

Male, forewing with the subcostal vein five-parted (including the vein itself as a branch), the first branch originating one-third before the end of the cell, the third a little before the end, the second nearer the first than the third, the fourth from the third halfway to the apex, the fifth close to the apex, very short. Discocellular veins nearly straight, the lower half again as long as the upper, cell slightly longest at its lower angle, second bifurcation of the median vein a little before its end. Submedian vein exceedingly remote from the median, straight for nearly half of its length, then bent downwards like a bow. In the interno-median space discally, there is a deep oblique depression on the upperside, covered with short grey down, and bearing a conspicuous extensile tuft of long orange hairs produced downwards and outwards over the depression. Hindwing with the two lower median branches forking simultaneously from the end of the cell; a long tail from the submedian, a short one from the lower median vein.

The curious scent-organ in the middle of the forewing of the male, resembling that of *Dacalana* and *Arrhenothrix*, has so distorted the venation that I have thought it advisable to separate this genus from *Neocheritra*. Whether the male has five and the female four subcostal branches, as in that genus, I do not know.

7. THRIX GAMA, Distant, (*Neocheritra gama*).

Above black, a tuft of orange hairs over a small grey cavity in the middle of the forewing. Hindwing with the lower part white, containing two black spots; above this grey, with three black spots on the boundary between the grey and the white; the upper part of the wing black. Below as in the female. The species apparently mimics *Eoöxylides tharis*.

Rare at Padang Rengas, Malay Peninsula. I have also taken it in the mountains of south-western Sumatra.

Subfamily *PORITINÆ*.

Genus MASSAGA, mihi. I find that in the male of *M. pediada*, the type of this genus, there is a narrow tuft of prostrate black hairs arising at the end of the cell, extending beyond it along the upper border of the upper median vein. This was pointed out to me in *M. pharyge* by Mr. de Nicéville and I afterwards found it in *M. pediada*. In *M. potina* it is apparently present, but very small and inconspicuous. In all these species the upper tuft is of considerable size, yellowish or whitish, turned upwards along the upper subcostal vein, in a large whitish patch. In

Poritia, the lower tuft is absent, the upper one black or dark brown, without the whitish patch.

Subfamily *LYCÆNINÆ*.

Genus **Phengaris**, novum. The splendid Chinese butterfly *Lycæna atroguttata*, Oberthür, deserves to be placed in a separate genus or subgenus, distinguished from *Lycæna* by the upper discocellular vein of the hindwing being short and angled outwardly, the lower discocellular meeting the median vein opposite its second forking.

This butterfly is certainly the finest of the subfamily, unless the *danis* group of *Cyaniris* be excepted. I was not able to detect any odour about it, but it has all the air of a protected species. I often saw it in the meadows of the Kutcha Naga country, Naga Hills, from 6000 to 8000 feet elevation, flying very slowly and visible from a great distance, so that I caught a good number, in spite of its rarity. The character of its markings, round black spots on a pure white ground, is very remarkable. It is hard to avoid thinking *Tajuria maculata*, Hew. a mimic of this species, though it seems to live at a lower elevation, and further to the westward. *Taraka hamada* is somewhat similarly marked, and is obviously protected.

I have taken the name *Phengaris*, which means *a daughter of the moon*, from the modern Greek.

Subfamily *GERYDINÆ*.

8. **Gerydus heracleion**, n. sp.

Male, forewing less acute than in *G. symethus*, hindwing rounded. *Above*, brown, forewing with a slaty gloss, the apex darker, a broad oblique white band from the upper end of the cell and beyond it (above the cell it is obscure), almost to the middle of the interno-median space, the outer part dehiscent along the lower median vein, projecting furthest in the lower median space (unlike *symethus*). The band is much broader than in *Gerydus biggsii*, Distant, (*gopara*, de Nicéville). Hindwing all dark. *Below*, the white band of the forewing is obscure and broken, the spot in the lower median space quite separate from and more distinct than the rest, the transverse lunular band obsolescent in the forewing, three costal ring-spots, three small subapical lunules. Hindwing, much less clouded with blackish than in *G. croton*, the lunular transverse band nearly regular, the basal spots quadrate, the submarginal black dots very distinct.

Perak, Malay Peninsula.

The species is larger than *G. symethus*, not quite so large as *G. ancon*. The upper median vein of the male is naked above and swollen from the end of the cell one-fourth towards the outer margin. This may be regarded as a generic character of *Gerydus*, since it occurs at any rate in *G. symethus*, *biggsii*, *boisduvalii*, *heracleion*, *irroratus* var. *assamensis*, and *ancon*. In *G. croton* the swelling is indistinct, and the vein is covered with black scales.

9. GERYDUS IRRORATUS, Druce, var. ASSAMENSIS, nov. Pl. I. Fig. 7.

Above, unmarked except by a small, pale, longitudinal area around the base of the upper median vein on the forewing. Below, pale grey-brown, without the dark markings of *G. boisduvalii*, a small pale area on the forewing below the middle median vein, the markings lunular, those in the cell of the forewing reduced, the transverse discal band of the forewing subapical, extending only to the upper median vein, a single conspicuous dark lunule near the lower angle; the transverse band of the hindwing regular, an undulated, continuous submarginal dark line.

Dhansiri Valley, Naga Hills.

It resembles *G. melanion* from the Philippines, but is without the white area near the lower angle of the forewing above. It may be conspecific with Mr. Druce's *G. irroratus* (from Siam) which has never been figured or properly described.

I have taken what may be the female of *Gerydus irroratus* in Perak. Some pale markings represent the broken white band of *G. boisduvalii*, the hindwing is angled at the upper median vein.

The figure represents the transverse band of the hindwing incorrectly; it is really composed of separate annular lunules.

10. LOGANIA MASSALIA, n. sp., Pl. I, Fig. 8.

Female. Above black, a round, dull white discal area on the forewing from just above the upper median vein almost to the submedian vein. Below irregularly speckled and variegated; forewing with the costal and apical parts ochreous-brown, the rest blackish. Hindwing also tinged with ochreous, a submarginal dark area, and obscure dark transverse bands. Hindwing not angled, the margin entire.

Nearest an undescribed *Logania* from Perak, Malay Peninsula, which, however, has the upperside marked as in *L. marmorata*, and the margin undulated,

Margherita, Upper Assam.

EXPLANATION OF PLATE I.

Fig. 5. Arhopala khamti, n. sp. (Assam.)
Fig. 6. Flos ahamus, n. sp. (Assam.)
Fig. 7. Gerydus irroratus, Druce, var. assamensis, var. nov. (Assam.)
Fig. 8. Logania massalia, n. sp. (Assam.)
Figs. 1—5 refer to the previous paper on the Butterflies of Engano.

IV.—*Materials for a Flora of the Malayan Peninsula.*—*By* GEORGE KING, M. B., LL. D., F. R. S., C. I. E., *Superintendent of the Royal Botanic Garden, Calcutta.* No, 3.

(Continued from page 206 of Vol. LIX of 1890.)

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In the arrangement of the Natural families which is being followed in these papers (that of DeCandolle as modified by the late Mr. Bentham and Sir Joseph Hooker), the family *Dipterocarpeae* should have preceded *Malvaceae.* Delays have, however, occurred in the elaboration of that family; and, rather than postpone the publication of the remaining three *Thalamifloral* orders, I have decided to submit my account of these to the Society now, deferring my paper on the *Dipterocarpeae* and on the previously omitted *Anonaceae* to a future occasion.

ORDER XVII. MALVACEÆ.

Herbs, shrubs or trees; herbaceous portions often stellate-hairy or scaly. *Leaves* alternate, palminerved, simple, lobed, or rarely compound. *Stipules* free, sometimes caducous. *Bracteoles* 3 or more, free or combined, often forming an epicalyx. *Flowers* axillary or terminal, solitary, fascicled or cymose-paniculate, regular, hermaphrodite or 1-sexual. *Sepals* 5, valvate, free or connate. *Petals* 5, twisted-imbricate. *Stamens* ∞, rarely definite, adnate to the base of the petals; filaments monadelphous, forming a tube; anthers oblong or reniform, cells sinuous or twisted, linear or annular, ultimately 1-celled bursting longitudinally. *Ovary* 2-many-celled, entire, or lobed, of 2-5 or usually more carpels whorled round a central axis; styles connate below or throughout their length; ovules 1 or more, curved, attached to the inner angle of each carpel. *Fruit* of dry cocci, or capsular and loculicidal, often large and woody. *Seeds* reniform or obovid, sometimes arillate; albumen scanty, often mucilaginous or 0; embryo curved; cotyledons leafy, usually folded or crumpled.—Distrib. Abundant in warm regions, common in temperate, absent from arctic. Genera 57; known species about 700.

A. Staminal tube entire, or but slightly divided at the apex.

Tribe I. *Malveæ.* Herbs or shrubs. *Ripe carpels* separating from the axis. *Styles* as many as the carpels.

Ovules solitary; carpels with convergent, often beaked, apices ... ... 1. *Sida.*

Ovules 2 or more; carpels with divergent, not beaked, apices ... ... 2. *Abutilon.*

Tribe II. *Ureneæ.* *Styles or stigmatic branches* twice as many as the carpels.

Fruit of indehiscent cocci ... ... 3. *Urena.*

Tribe III. *Hibisceæ.* Herbs or shrubs. *Fruit* capsular. *Sepals* leafy. *Staminal-tube* truncate or 5-toothed at the apex.

Calyx toothed: stigmas distinct, spreading ... 4. *Hibiscus.*

" truncate: stigmas united ... ... 5. *Thespesia.*

B. Staminal tube short or divided into single filaments to its base.

Tribe IV. *Bombaciae.* Trees. *Sepals* leathery: styles connate or free. *Fruit* capsular.

Leaves digitately compound, calyx truncate or irregularly 3 to 5-lobed; seed silky outside.

Anthers solitary ... ... 6. *Bombax.*

" in groups of 2 or 3 ... ... 7. *Eriodendron.*

Leaves simple, usually scaly; fruit woody, muricate; seeds arillate.

Calyx tubular or bell-shaped.

Anthers linear, cells sinuous ... 8. *Durio.*

Anthers globose, opening by a pore ... 9. *Boschia.*

Calyx dilated at the base.

Calyx finally forming a cushion-shaped annulus ... ... 10. *Neesia.*

Calyx 5-pouched at the base, petals inserted on the calyx ... ... 11. *Cœlostegia.*

1. SIDA, Linn.

Herbs or undershrubs. *Leaves* entire or lobed. *Bracteoles* 0. *Calyx* of 5 valvate sepals, tubular below. *Corolla* of 5 petals, free above, connate below and adnate to the tube of the stamens. *Staminal-tube* dividing at the summit into numerous anther-bearing filaments. *Carpels* 5 or more, whorled; styles as many as the carpels, stigmas terminal.

Ripe carpels separating from the axis, generally 2-awned at the summit, and dehiscing irregularly or by a small slit. *Seed* solitary, pendulous or horizontal; radicle superior.—Distrib. A genus of about 80 species, most of them being tropical weeds.

1. S. MYSORENSIS, W. & A. Prod. I, 59. A sub-erect, sometimes decumbent, herb 1 to 2 feet high, covered with more or less glutinous hairs. *Leaves* cordate-ovate, acuminate, coarsely serrate-crenate, 1·5 to 2·5 in. long and 1 to 1·5 in. broad; petiole about half as long as the blade. *Stipules* linear, less than half as long as the petiole. *Flowers* less than ·5 in. in diam., in few-flowered axillary racemose cymes, corolla yellow; pedicels shorter than the petioles, jointed near the middle. *Carpels* shorter than the calyx, sub-glabrous, each with a short awn, or awnless. Mast. in Hook. fil. Fl. Br. Ind. I, 322; Thwaites Enum. 28. *S. hirta*, Wall. Cat. 1855, not of Lam. *S. urticæfolia*, W. & A., l. c. *S. nervosa*, Wall. Cat. 1853 E. *S. olens*, Ham. in Wall. Cat. 1874. *S. glutinosa*, Roxb. Hort. Beng. 97; Fl. Ind. iii, 172; Wall. Cat. 1855, not of Cav. *S. tenax*, Ham. in W. & A. Prodr. i, l. c.; Wall. Cat. 1855, E. F. *S. fasciculiflora*, Miq. Fl. Ind. Bat. i, Pt. 2, 140. *S. radicans* Cav. Diss. i, 8: W. & A. Prod. i, 59.

A weed by roadsides; in Perak and probably in the other provinces. Distrib. India, Java.

2. S. CARPINIFOLIA, L. An undershrub 2 to 3 feet high; glabrous or sub-glabrous; a few minute stellate hairs on the stems and petioles. *Leaves* linear-lanceolate, acute, serrate, 2 to 3 in. long and ·25 to ·35 in. broad; petioles ·1 to ·2 in. *Stipules* subulate, nerved, much longer than the petiole. *Flowers* ·5 in. in diam, solitary, axillary; corolla yellow, peduncles as long as the petiole, jointed, minutely bracteolate. *Carpels* shorter than the sub-globose ribbed calyx, glabrous, rugulose, each with 2 short awns. DC. Prod. i. 460. Mast. in Hook. fil. Fl. Br. Ind. i. 323; Wall. Cat. 1871. *S. acuta*, Burm.; Cav. Diss. i p. 15, t. 2, f. 3; DC. Prodr. i. 461; Wall. Cat. 1868, 1, 2. 3, 4, 5; Roxb. Fl. Ind. iii. 171; W. & A. Prodr. i. 57; Dalz. & Gibs. Bomb. Fl. 17; Thwaites Enum. 27; Miq. Fl. Ind. Bat. i. Pt 2. p. 143; Wight Ic. t. 95; Bl. Bijdr. 55; Wall. Cat. 1868 G. *S. lanceolata*, Roxb. l.c. 175; Wall. Cat. 1868 F. *S. stipulata*, Cav. Diss. i. t. 3, f. 10; DC. Prodr. i. 460; W. & A. Prodr. l.c. *S. Stauntoniana*, DC. l.c.; *S. scoparia*, Lour. ex W. & A. lc.

In all the provinces as a weed. Distrib. India and Tropics generally.

3. S. RHOMBIFOLIA, Linn. sp. 961. An erect under shrub 2 to 3 feet high, from glabrous to hoary, stellate-pubescent. *Leaves* varying

from ob-lanceolate or obovate to rhomboid, but always with tapering bases, serrate to crenate; under surface hoary, rarely green; length ·5 to 2·5 in., petiole ·1 to ·2 in. *Stipules* setaceous, longer than the petioles. *Flowers* ·5 in. in diam., axillary, solitary; corolla yellow, rarely white; peduncles much longer (sometimes six times) than the petioles, variously and sometimes indistinctly jointed, ebracteolate. *Carpels* smooth or pubescent, or reticulate, each usually with 1 or 2 rather long awns, sometimes awnless, generally longer than the calyx. Mast. in Hook. fil. Fl. Br. Ind. i. 323; Miq. Fl. Ind. Bat. i. pt. 2. p. 142; DC. Prodr. i. 462; Roxb. Fl. Ind. iii. 176; Wall. Cat 1862, 2; Thwaites Enum. 28. *S. canariensis*, Willd.; DC. Prodr. i. 462. *S. compressa*, Wall. Cat. 1866; DC. Prodr. i. 462.

This very polymorphic species has been divided into varieties by Dr. Masters in Hooker's Fl. Br. Ind. l.c. as follows:—

"Var. 1. *scabrida*, W. & A. Prodr. i. 57 (sp.); sprinkled with rigid hairs, leaves concolorous, peduncles joined at the base, carpels awned.

"Var. 2. *retusa*, Linn. (sp.); leaves obovate retuse hoary underneath, peduncles equalling the leaves jointed above the middle, carpellary awns short.—Cav. Diss. i. t. 3, f. 4, and Diss. v. t. 131, f. 2; Bl. Bijdr. 75; W. & A. Prodr. i. 38; Wall. Cat. 1870; DC. Prodr. i. 462; Roxb. Fl. Ind. iii. 175; Dalz. & Gibs. Bomb. Fl. 17; Miq. Fl. Ind. Bat. i. pt. 2, 142. *S. chinensis*, Retz ex Roxb. Hort. Beng. 97; Fl. Ind. iii. 174. *S. philippica*, DC. Prodr. i. 462; W. & A. Prodr. l.c.; Wall. Cat. 1869; Rheede Hort. Mal x. 18; Rumph. Amb. v. t. 19.—The *S. corynocarpa*, Wall. Cat. 1870, seems to be a form of this variety, with densely intricate woody branches, and long carpellary awns.

"Var. 3. *rhomboidea*, Roxb. Hort. Beng. 50; Fl. Ind. iii. 176 (sp.); leaves rhomboid hoary beneath, peduncles jointed at the base, carpellary awns very short inflected. DC. Prodr. i. 462; W. & A. Prodr. i. 57, Wall. Cat. 1862 E., 1863; Thwaites Enum. 28. *S. rhombifolia*, Wall. Cat. 1862 F.? *S. orientalis*, Cav. Diss. i. t. 12.—The flowers expand at noon (Roxb.).

"Var. 4. *obovata*, Wall. Cat. 1864 (sp.); leaves 1½ by 2 in., broadly obovate, hoary beneath, apex coarsely toothed, base cuneate, petiole ¼ in., peduncle longer than the petiole shorter than the blade.

"Var. 5. *microphylla*, Cav. Diss. i. t. 12, f. 2 (sp.); leaves small, elliptic dentate hoary beneath, peduncle slightly exceeding the petiole, carpels 5-7 awned.—Roxb. Fl. Ind. iii. 170; DC. Prodr. i. 461."

In all the provinces—a common weed. Distrib. The Tropics generally.

4. S. CORDIFOLIA, Linn. spec. 961. An erect softly hairy undershrub

2 to 3 feet high, the hairs on the branches and petioles long and spreading. *Leaves* oblong-cordate, obtuse, rarely acute, crenate; both surfaces, but especially the pale lower surface, softy hairy; length 1·25 to 2 in., breadth ·8 to 1·25: petiole slightly longer than the blade. *Stipules* linear, less than half the length of the petiole. *Flowers* ·6 in. in diam., axillary, solitary; corolla yellow; peduncles jointed near the apex, varying in length, the lower longer, the upper shorter, than the petioles. *Carpels* boldly 3-angled, reticulate, sub-glabrous, crowned by 2 strong, divergent, retro-hispid awns. DC. Prod. i. 464, Roxb. Fl. Ind., iii. 177; Wall. Cat. 1849; W. & A. Prod. i. 58; Thwaites Enum. 28. Dalz. & Gibs. Fl. Bombay, 17; Mast. in Hook. fil. Fl. Br. Ind. i. 324, and in Oliver's Fl. Trop. Afr. i. 181; Miq. Fl. Ind. Bat. i. pt. 2, 140. *S. herbacea*, Cav. Diss. i. 19, t. 13, f. 1; DC. Prodr. i. 463. *S. micans*, Cav. Diss. i. 19, t. 3. f. 1. *S. rotundifolia*, Cav. Diss. i. 20, t. 3, f. 6, and Diss. vi. t. 194, f. 2; Wall. Cat. 1849, D; DC. Prodr. i. 464. *S. althæifolia*, Swartz, Guill. & Per. Fl. Seneg. i. 73.—Rheede Hort. Mal. x. t. 54.

In Malacca: and probably in all the Provinces as a weed. Distrib. The Tropics generally.

2. ABUTILON, Gærtn.

Herbs or undershrubs more or less covered with down. *Leaves* angled or palmately-lobed. *Inflorescence* axillary or terminal. *Bracteoles* 0. *Calyx* of 5 valvate sepals, tubular below. *Corolla* of 5 petals, free above, connate below and adnate to the tube of the stamens. *Staminal-tube* divided at the apex into numerous filaments. *Carpels* 5-8. Styles as many as the carpels. Ripe *carpels* separating from the axis, awned or not, 1- or more-seeded. *Seeds* reniform. Distrib. About 70 species, all tropical or subtropical.

A. INDICUM, G. Don. Gen. Syst. i. 504. An annual or perennial undershrub. *Leaves* broadly cordate, irregularly and coarsely toothed or sub-entire, pale and minutely pubescent on both surfaces, often with a few longer hairs intermixed, length 1 to 2 in., breadth. 1 to 2 in.; petiole usually longer than the blade. *Flowers* 1 in. in diam, axillary, solitary, the peduncles longer than the petioles, jointed near the top; corolla yellow. *Sepals* ovate, acute, shorter than the spreading petals. *Carpels* 15 to 20, longer than the calyx, truncate or with short spreading awns, tomentose at first, ultimately sub-glabrous. *Seeds* dark brown, minutely stellate-hairy. Mast. in Hook. fil. Fl. Br. Ind. i. 326; *A. asiaticum*, W. & A. Prodr. i. 56, not *Sida asiatica*, Linn.; W. & A. Prodr. i. 56; Wight Ic. t. 12; Dalz. & Gibs. Bomb. Fl. 18; Thwaites Enum. 27; Mast. in Oliv. Fl. Trop, Afr. i. 186; Miq. Fl. Ind.

Bat. i. pt. 2, 146. *Sida indica*, L.; DC. Prodr. i. 471; Cav. Diss. i. p. 33, t. 7, f. 10; Roxb. Fl. Ind. iii. 179; Wall. Cat. 1859, 1, 2, D. F. *Sida populifolia*, W. & A. l.c. *A. populifolia*, G. Don. l.c. *Sida populifolia*, DC. Prod. i. 470; Cav. Diss. i. t. 7, fig. 9; Roxb. Fl. Ind. iii. 179; Bl. Bijdr. 79. *S. Beloere*, L'Her. Stirp. i. 130. *S. Eteroomischos*, Cav. Diss. ii. 55 and v. p. 275, t. 128.

Singapore, Selangore and probably in all the other provinces. A weed.

3. URENA, Linn.

Herbs or undershrubs, more or less covered with rigid stellate hairs. *Leaves* angled or lobed. *Flowers* clustered. *Bracteoles* 5, adnate to the 5-cleft calyx, sometimes coherent at the base into a cup. *Petals* 5, often tomentose at the back, free above, connate below and united to the base of the tube of the stamens. *Staminal-tube* truncate or minutely toothed. *Anthers* nearly sessile. *Ovary* 5-celled, cells 1-ovuled, opposite the petals; stigmatic branches 10; stigmas capitate. *Ripe carpels* covered with hooked bristles or smooth, indehiscent, separating from the axis when ripe. *Seed* ascending; cotyledons bent and folded; radicle inferior. Distrib. Species 4-5, natives of tropical and subtropical countries, 2 only being confined to Asia.

U. LOBATA, Linn. Spec. 974. A herbaceous undershrub 1 to 3 feet high, more or less hairy. *Leaves* very variable; the lower rotund to reniform, more or less cordate at the base, the apex usually acute, edges with 5 to 7 shallow lobes or sub-entire, 5 to 7-nerved; length 1 to 2 in., breadth 1 to 2·5 in.; upper leaves smaller and sometimes ovate to linear-lanceolate, 3-nerved. *Petiole* shorter than the blade; bracteoles oblong-lanceolate, as long as the sepals. *Corolla* pink, ·5 to 1 in. in diam. *Carpels* tomentose, and with many smooth hooked spines. Mast. in Hook. fil. Fl. Br. Ind. i. 329; Miq. Fl. Ind. Bat. i. pt. 2, p. 149; Cav. Diss. iv. p. 336, t. 185, fig. 1; Miq. Pl. Jungh. 283; DC. Prodr. i. 441; Roxb. Fl. Ind. iii. 182; W. & A. Prodr. i. 56; Wall. Cat. 1928; Dalz. & Gibs. Bomb. Fl. 18; Thwaites Enum. 25; Miq. Fl. Ind. Bat. i. pt. 2, 148. *U. cana*, Wall. Cat. 1930 B. *U. palmata*, Roxb. Fl. Ind. iii 182. *U. tomentosa*, Bl. Bijdr. 65.

All the Provinces: a weed. Distrib. The tropics generally.

Var. 1. *sinuata*, Miq. Fl. Ind. Bat. l.c.; leaves deeply 5-lobed, the lobes narrowed at the base, serrate, often pinnatifid, bracteoles linear; flowers often smaller than in the typical plant. *U. sinuata*, Linn.; DC. Prodr. i. 441; Roxb. Hort. Beng. 50; Fl. Ind. iii. 182; Wall. Cat. 1933 E.; W. & A. Prodr. i. 46; Hook. Fl. Br. Ind. i. 329; Thwaites Enum.

Pl. Cey. 25; Dalz. & Gibs. Bomb. Fl. 18. *U. muricata*, DC. Prodr. i. 442. *U. Lappago*, DC. Prodr. i. 441. *U. morifolia*, DC. Prodr. i. 442? *U. heterophylla*, Smith in Rees' Cycl. 37; Wall. Cat. 1933 E, F. G, H, K. *U. tomentosa*, Wall. Cat. 1933 H.;—Burm. Zeyl. t. 69, f. 2.

Distributed like the last.

Var. 2. *scabriuscula*, DC. Prod. i. 441 (sp.); herbaceous; leaves roundish, scarcely lobed, with 1-3 glands beneath; bracteoles linear, longer than the sepals. *U. scabriuscula*, Wall. Cat. 1928 F; W. & A. Prodr. i. 46; Dalz. & Gibs. Bomb. Fl. 18.

4. HIBISCUS, Linn.

Herbs, shrubs, or trees. *Leaves* stipulate, usually more or less palmately-lobed. *Inflorescence* axillary, rarely terminal. *Bracteoles* 5 or more, free, or connate at the base. *Calyx* 5-toothed or 5-fid, valvate, sometimes spathaceous. *Petals* 5, connate at the base with the staminal-tube. *Staminal-tube* truncate or 5-toothed at the summit; filaments many; anthers reniform, 1-celled. *Ovary* 5-celled, cells opposite the sepals, each with 3 or more ovules; styles 5, connate below; stigmas capitate or sub-spathulate. *Capsule* loculicidally 5-valved, sometimes with a separate endocarp, or with false dissepiments forming a spuriously 10-celled fruit. *Seeds* glabrous, hairy or woolly. About 150 species; distributed chiefly in the tropical regions of both hemispheres.

Calyx spathaceous, deciduous ... ... 1. *H. Abesmoschus.*
Calyx persistent, 5-cleft.
  Bracteoles of involucre distinct, their apices spathulate ... ... 2. *H. Surattensis.*
  Bracteoles united at the base, nearly as long as the calyx ... ... 3. *H. macrophyllus.*
  Bracteoles united into a cup much shorter than the calyx.
    Involucre and calyx softly pubescent 4. *H. tiliaceous.*
    " " rugulose 5. *H. floccosus.*

1. H. ABELMOSCHUS, Linn. Spec. 980. A stout annual undershrub 2 to 3 feet high: young branches and peduncles retro-hispid, all other parts hispid or stellate-hispid. *Leaves* variable, usually with 3 to 5, deep, oblong-lanceolate or linear, serrate-crenate, acute lobes, sometimes hastate or sagittate, the base always rounded; length and breadth 3 to 5 in.; petiole longer than the blade: stipules minute, subulate, fugaceous. *Flowers* 3 in. in diam., axillary, solitary; peduncles shorter than the petioles, ebracteate. *Involucres* 8 to 12, linear, ·5 to ·75 in. long. *Calyx* 1·25 in. long, toothed at the apex. *Corolla* yellow with a crimson

centre, glabrous. *Capsule* oblong, pointed, hispid, becoming subglabrous, 1 to 3 in. long. *Seeds* reniform, striate, glabrous, musky. Mast. in Hook. fil. Fl. Br. Ind. i. 342 (excl. syn. *H. sagittifolius*, Kurz.); DC. Prod. i. 452; Roxb. Fl. Ind. iii. 202; Griff. Not. iv. 521. *Abelmoschus moschatus*, Mœnch; W. & A. Prod. i. 53; Wight Ic. t. 399; Wall. Cat. 1915, F, G, H, I, K, L; Thwaites Enum. 27; Miq. Fl. Ind. Bat. i. pt. 2, 151. *H. flavescens*, Cav. Diss. iii. t. 70, f. 2; DC. l.c. 454. *H. spathaceus*, Wall. Cat. K. *H. ricinifolius*, Wall. Cat. 1915. *Bamia chinensis*, Wall. Cat. 1616? *Hibiscus pseudo-abelmoschus*, Bl. Bijdr. 70. *H. longifolius*, Willd. Spec. iii. 827; DC. Prod. i. 450. *Bamia multiformis* and *betulifolia*, Wall. Cat. 1917 and 1918.

In all the Provinces; cultivated or naturalised. Distrib. the tropics generally.

2. H. SURATTENSIS, Linn. Spec. 979. A weak straggling undershrub; the branches, petioles and peduncles with small recurved prickles and a few soft spreading pale hairs. *Leaves* palmately 3 to 5-partite, rarely ovate, sub-entire, serrate, sparsely pilose; length and breadth 1·5 to 3 in.; petiole slightly longer than the blade. *Stipules* broadly ear-shaped. *Flowers* 2 to 2·5 in. long, solitary, axillary, corolla yellow with dark centre; bracts of involucre 10 to 12, linear with spathulate apices. *Capsules* membranous, the individual carpels with 3 bold aculeate nerves and a long terminal point. *Seeds* with long straight brittle yellowish hairs. Mast. in Hook. fil. Fl. Br. Ind. i. 334; Miq. Fl. Ind. Bat. i. pt. 2, 161; Bl. Bijdr. 68; DC. Prodr. i. 449; W. & A. Prodr. i. 48; Roxb. Fl Ind. iii. 205; Wight Ic. t. 197; Cav. Diss. iii. t. 53, f. 1; Thwaites Enum. 26; Wall. Cat. 1893, 1, 2, 3, D, E, F, G; Dalz. & Gibs. Bomb. Fl. 20; Mast. in Oliv. Fl. Trop. Afr. i. 201; Miq. Fl. Ind. Bat. i. pt. 2, 161. *H. furcatus*, Wall. Cat. 1896 C, not of Roxb.

Malacca, Perak, and probably in the other Provinces. Distrib. The tropics generally.

This has a decumbent or even climbing habit.

3. H. MACROPHYLLUS, Roxb. Hort. Beng. 51. A large shrub or small tree, all parts more or less covered with pale soft minute velvetty tomentum; the young branches, petioles, pedicels, bracteoles and calyx bearing, in addition, numerous more or less deciduous tufts of long spreading stiff tawny hairs. *Leaves* large, on long petioles, cordate-orbicular to reniform, the apex shortly sharply and abruptly acuminate, the edges entire; palmately 7 to 9-nerved; length and breadth 7 to 12 in.; petiole usually longer than the blade. *Stipules* oblong, convolute, hispid-tomentose, 3 to 4 in. long. *Flowers* in terminal cymes, pedicels

1·5 to 2 in. long, articulate near the apex and bearing two large broadly ovate deciduous bracts. *Involucres* of the individual flower 10 to 12, linear-lanceolate, connate at the base, as long as the calyx, hispid-tomentose like the calyx. *Calyx* with 5 deep linear teeth; the tube 10-ribbed, 1 to 1·25 in. long. *Corolla* 4 in. in diam., purple. *Fruit* pointed, hispid, as long as the persistent calyx. *Seeds* reniform, their edges densely fulvous-sericeous. Mast. in Hook. fil. Fl. Br. Ind. i. 337; Kurz For. Fl. Br. Burm. i. 126; DC. Prod. i. 455; Wall. Pl. As. Rar. i. 44, t. 51; Wall. Cat. 1903. *H. setosus*, Roxb. Fl. Ind. iii. 194. *H. vestitus*, Griff. Notul. iv. 519.

Penang, Perak. Distrib. Java, India.

4. H. TILIACEUS, Linn. Spec. 976. A small much branched tree; young branches minutely pubescent. *Leaves* sub-coriaceous, broadly cordate to reniform, minutely crenulate or entire, rarely lobed, acute; upper surface scaly, minutely pubescent, glabrescent or glabrous; lower densely and minutely hoary-pubescent; nerves 7 to 9 pairs, palmate; length and breadth 3·5 to 6·5 in., petioles ·5 to 2 in., stipules oblong, oblique, shorter than the petiole. *Flowers* solitary; or in pedunculate, solitary, 2 to 3-flowered, axillary cymes; the peduncles 2 or 3 times as long as the petioles, with 2 obliquely oblong, opposite, pubescent, caducous bracts. *Involucres* 7 to 10, acute, united above the middle. *Sepals* 5, like the involucres but twice as long, with an elongated gland externally. *Corolla* campanulate, 4 in. in diam., yellow with crimsom centre. *Fruit* as long as the calyx or shorter, ovate-acute, stellate-pubescent, spuriously 10-celled. *Seeds* few, obovate-reniform, faintly striate, sparsely scaly, pubescent, or glabrous. Mast. in Hook. fil. Fl. Br. Ind. i. 343; Kurz For. Fl. Burm. i. 126; DC. Prod. i. 454; Cav. Diss. iii. p. 151, t. 55, f. 1; Bl. Bijdr. 72; Roxb. Fl. Ind. iii. 182; Miq. Fl. Ind. Bat. i. pt. 2, 153; Beddome Fl. Sylvat. Anal. Gen. t. 4. *Paritium tiliaceum*, A. Juss. in St. Hil. Fl. Bras. Med. i. p. 156; (excl. syn. *H. elatum*) W. & A. Prodr. i. 52; Wight Ic. t. 7; Wall. Cat. 1912; Thwaites Enum. 26; Dalz. & Gibs. Bomb. Fl. 17; Griff. Notul. iv. 523. *H. tortuosus*, Roxb. Fl. Br. Ind. iii. 192; Wall. Cat. 1912 G, 1913 B.

All the provinces; near water. Distrib. The tropics generally near the coasts.

5. H. FLOCCOSUS, Mast. in Hook. fil. Fl. Br. Ind. i. 343. A tree 30 to 40 feet high; young branches, petioles, peduncles and outer surfaces of involucres and calyx rugulose and minutely rusty-puberulous. *Leaves* sub-coriaceous, cordate-reniform, 5-angled, acute, irregularly and

distantly sub-crenate; both surfaces minutely and sparsely stellate-pubescent, glabrescent when old, harsh; length and breadth 2 to 6 in., petiole less than half as long as the blade. *Flowers* in stout few-flowered terminal racemes longer than the leaves; peduncles stout, very rugulose, ebracteate, ·75 to 1·5 in. long. *Involucres* combined into a bluntly-lobed cup much shorter than the calyx. *Sepals* oblong-lanceolate, 1·5 in, long, coriaceous, united for half their length or more. *Petals* membranous, spathulate, 4 in. long, glabrous inside, boldly striate and hispid-pubescent externally. *Staminal-tube* stellate-pubescent. *Capsule* obovoid, truncate, shorter than the persistent closely adherent calyx, densely stellate-pubescent and very rugulose, 5-valved, dehiscing only at the apex. *Seeds* numerous, obovate, sub-compressed, with shortly pilose angles, the rest of the surface scaly.

Mount Ophir, Malacca; Maingay (Kew Distrib.) 216. Perak; King's Collector 7024.

I have not been able to detect stipules on any of the specimens I have seen. They are probably fugacious.

5. THESPESIA, Corr.

Trees or shrubs. *Leaves* entire. *Inflorescence* axillary. *Bracteoles* 5-8, arising from the thickened end of the peduncle, deciduous. *Calyx* cup-shaped, truncate, minutely 5-toothed. *Corolla* convolute. *Staminal-tube* 5-toothed at the apex. *Ovary* 4-5-celled; style club-shaped, 5-furrowed, entire or 5-toothed; ovules few in each cell. *Capsule* loculicidal or scarcely dehiscent. *Seeds* tomentose; cotyledons conduplicate, black-dotted.—Natives of tropical Asia, Madagascar, and Australasia; species about 6.

T. POPULNEA, Corr. in Ann. Mus. ix. p. 290. A tree 20 to 30 feet high, young shoots scaly. *Leaves* on long petioles, sub-coriaceous, broadly cordate, acuminate, entire, glabrous above, sparsely scaly on lower surface; the base 5 to 7-nerved with a glandular pore between the nerves; length 4·5 to 6 in., breadth 3 to 4 in. petiole 2·5 in. *Flowers* 2 to 3 in. in diam., solitary, axillary, on peduncles shorter than the petioles; *petals* bright yellow with a brown spot at the base; bracteoles close to the calyx, lanceolate, often abortive. *Capsule* 1 to 1·5 in. in diam., depressed-spheroidal, scaly, becoming glabrescent; pericarp of 2 layers. *Seeds* 1 to 3 in each cell, reniform, minutely tomentose or mealy. Mast. in Hook. fil. Fl. Br. Ind. i. 345; Kurz For. Fl. Burm. i. 128; Miq. Fl. Ind. Bat. i. pt. 2, 150; Pierre Fl. For. Coch-Chine x. 173; Bl. Bijdr. 73; Cav. Diss. iii. 152, t. 56, f. 1; DC. Prodr. i. 456; W. & A. Prodr. i. 54; Wight Ic. t. 8; Thwaites Enum. 27; Beddome Fl. Sylvat. t. 63;

Dalz. & Gibs. Bomb. Fl. 18; Wall. Cat. 1888, 1, 2, & C to H. Miq. Fl. Ind. Bat. i. pt. 2, 150. *Hibiscus populneus*, L.; Roxb. Hort. Beng. 51; Flor. Ind. iii. 190. *H. populneoides*, Roxb. l.c. *Malvaviscus populneus*, Gærtn. Fruct. ii. 253, t. 135. *Azanza acuminata*, Alefeld Bot. Zeit. 1861, 299.

In all the provinces, on the sea-shore. Distrib. Tropics generally.

6. BOMBAX, Linn.

Trees. *Leaves* digitate, deciduous. *Peduncles* axillary or subterminal, solitary or clustered, 1-flowered. *Flowers* appearing before the leaves. *Bracteoles* 0. *Calyx* coriaceous, cup-shaped, truncate or lobed. *Petals* obovate or oblong. *Stamens* in 5 bundles opposite the petals: filaments numerous; anthers reniform, 1-celled. *Ovary* 5-celled, multiovulate; style clavate, stigmas 5. *Capsule* loculicidally 5-valved, valves coriaceous, wooly within. *Seeds* silky, the testa thin, albumen small; cotyledons contortuplicate. About 10 species, all tropical and mostly American; 1 in Africa.

1. B. INSIGNE, Wall. Pl. As. Rar. i. 71, t. 79, 80; Cat. 1841. A tall tree; trunk without prickles; branchlets armed or not; all parts glabrous. *Leaves* 7-9-foliolate; leaflets sub-coriaceous, obovate or oblanceolate, shortly acuminate, attenuate at the base, glaucous beneath; length 5 to 8 in., breadth 2·5 to 3 in.; petiolules ·5 to ·75 in.: petioles longer than the leaflets. *Flowers* 5 or 6 in. long, solitary towards the end of the leafless branches; peduncles ·75 in. long, stout, clavate. *Calyx* 1·5 in. long, thickly coriaceous, urceolate-globose, obscurely and irregularly lobed, ultimately 2-cleft, sub-glabrous outside, silky inside. *Petals* fleshy, oblong, obtuse, recurved, internally glabrous, externally shortly sericeous, red to orange or yellowish. *Stamens* many; filaments fleshy, united for ·5 in. above the base into 4 or 5 bundles. *Capsule* oblong, 10 in. long by 1·5 in thick, curved, glabrous. Mast. in Hook. fil. Fl. Br. Ind. i. 349; Kurz For. Fl. Burm. i. 130; Journ. As. Soc. Beng. 1873, ii. p. 61. *B. festivum*, Wall. Cat. 1841.

Andamans. Distrib. Burmah.

The earliest name of this is *B. festivum* (1828). But at p. 89 of his Catalogue, Wallich changed this to *B. insigne*, under which name he figured and described it. It comes very near to *B. malabaricum*, DC.; but Wallich says it is a much smaller tree, and Kurz says it has many more stamens, than the former. I include it as an Andaman plant solely on the authority of the late Mr. Kurz, but I have seen no specimen collected by him or by any other person in the Andamans. And I have a strong suspicion that what Kurz regarded as *B. insigne* is really an undescribed species which Wallich issued as 1840-2 B of his Catalogue under the name *B. malabaricum*, var. *albiflora*. His No. 3 of the same name I have not seen. A tree with leaves exactly like Wallich's 1840-4 and with unarmed trunk and branches has recently been collected in the little Coco Island by Dr. D. Prain for the Calcutta Herbarium.

2. B. MALABARICUM, DC. Prod. i. 479. A tree with the general characters of the last, but much larger; and with the trunk and branches prickly, the leaflets much narrower (lanceolate not obovate) and the flowers and fruit smaller. Mast. in Hook. fil. Fl. Br. Ind. i. 349; Kurz For. Fl. Burm. i. 136; Bl. Bijdr. 81; Wight Ill. t. 29; W. & A. Prodr. i. 61; Wall. Cat. 1840 (exclude No. 4 and possibly No. 2 B); Beddome Fl. Sylvat. t. 82. *Salmalia malabarica*, Schott Meletem, 35; Thwaites Enum. 28; Dalz. & Gibs. Bomb. Fl. 22; Miq. Fl. Ind. Bat. i. pt. 2, 166. *Bombax heptaphylla*, Cav. Diss. v. p. 296; Roxb. Hort. Beng. 50; Cor. Pl. iii. t. 247; Fl. Ind. iii. 167. *B. Ceiba*, Burm. Fl. Ind. 145, excl. syn. *Gossampinus rubra*, Ham. in Trans. Linn. Soc. xv.

Andaman Islands; common.

7. ERIODENDRON, DC.

Trees. *Leaves* digitate, deciduous. *Flowers* appearing before the leaves, tufted at the ends of the branches, or axillary, large white or rose-coloured. *Bracteoles* 0. *Calyx* cup-shaped, truncate, or 3-5-fid. *Petals* oblong. *Staminal* bundles 5, opposite the petals, connate at the base, each bearing 2-3 sinuous or linear anthers. *Ovary* ovoid, 5-celled; style cylindrical, dilated, stigma obscurely 5-lobed. *Capsule* oblong, coriaceous or woody, 5-celled, 5-valved, valves densely silky within. *Seeds* globose or obovoid; testa crustaceous, smooth with silky hairs, albumen scanty; cotyledons contortuplicate.—About eight species—1 Asiatic and African, the others American.

1. E. ANFRACTUOSUM, DC. Prod. i. 479. A tall tree, the trunk prickly when young; branchlets stout, smooth, glaucous. *Leaflets* 8 or 9, lanceolate, acuminate, entire or serrulate towards the apex, the base acute; glaucous beneath; length 3 to 4 in., breadth ·75 to 1 in., petiolule ·25 in. broad; petioles usually longer than the leaflets. *Flowers* pedunculate, in fascicles of 3 to 8 below the apices of the branches; peduncles 1 to 2 in. long, minutely bracteate: involucre none. *Calyx* cup-shaped, with 5 rounded lobes, glabrous externally, sericeous internally. *Petals* oblanceolate, tomentose externally, glabrous within, 1 to 1·5 in. long, whitish. *Filaments* shorter than the petals. *Capsule* oblong, 3 to 5 in. long, smooth. *Seeds* numerous, sub-ovoid, black. Mast. in Hook. fil.

Fl. Br. Ind. i. 350; Bl. Bijdr. 81; W. & A. Prodr. i. 61; Wight Ic. t. 400; Griff. Not. iv. 533; Dalz. & Gibs. Bomb. Fl. 22; Miq. Fl. Ind. Bat. i. pt. 2, 166; Beddome Fl. Sylvat. Anal. Gen. t. 4. Wall. Cat. 1839. *Bombax pentandrum*, Linn. Sp. Pl. 989; Cav. Diss v. 293, t. 151; Roxb. Fl. Ind. iii. 165. *B. orientale*, Spreng. Syst. iii. 124. *Ceiba pentandra*, Gærtn. Fruct. ii. 244, t. 133; Ham. in Trans. Linn. Soc. xv. 126. *Eriodendron orientale*, Steud. Nomencl. 587; Thwaites Enum. 28; Kurz For. Fl. Br. Burm. i. 131.

In all the provinces. Distrib. Malayan Archipelago, British India, West Indies. Often planted.

8. Durio, Linn.

Trees, with entire coriaceous penni-nerved leaves, scaly beneath (except in *D. Oxleyanus*). *Flowers* in lateral cymes: peduncles angular. Bracts 2 or 1, connate into a cup, or distinct below, tips free, deciduous. *Calyx* bell-shaped, leathery, like the bracteoles densely scaly, the sepals distinct, or 5-fid, lobes valvate oblong or rounded. *Petals* 5, contorted-imbricate, spathulate, longer than the sepals. *Staminal-tube* divided into 4-5 phalanges opposite the petals; filaments many, bearing a globose head of sinuous 1-celled anthers, or (in *D. Oxleyanus*) a single annular 1-celled anther. *Ovary* usually scaly externally, 4-5-celled; styles connate, stigmas capitate; ovules many and 2-seriate in each cell. *Fruit* very large, subglobose or oblong, spiny, indehiscent or loculicidally 5-valved. *Seeds* arillate; cotyledons fleshy, often connate. Distrib. Malay Peninsula and islands; species 3.

1. D. Zibethinus, Linn. Syst. Nat. edit. xiii. p. 581. A tall tree; young branches thin and, like all the soft parts except the upper surfaces of the leaves, minutely scaly. *Leaves* elliptic-oblong, rarely obovate-oblong, shortly and abruptly acuminate, the base rounded; both surfaces shining, the upper glabrous, the lower adpressed-lepidote; main nerves 10 to 12 pairs, thin, slightly ascending; length 4·5 to 6 in., breadth 1·5 to 1·8 in., petiole ·4 to ·5 in. *Flowers* 2 in. long, 2 to 3 in. in diam., on long slender pendulous dichotomus peduncles in fascicles from the stem and larger branches, globose in bud: peduncles lepidote, 3 in. long, the bracts embracing the calyx and shorter than it. *Calyx* tubular, ventricose at the base, the limb with 5 or 6 short broad teeth. *Petals* twice as long as the calyx, spathulate. *Stamens* in 5 bundles united only at the very base; the filaments in each bundle united for one-fourth of their length: anthers glomerulate, reniform, compressed. *Ovary* elongate-ovoid, scaly; style pubescent, as long as the stamens. *Fruit* ovoid-globose, 8 to 12 in. long, woody, densely covered with strong

smooth pyramidal spines, 5-valved. *Seeds* few, large, with copious succulent arillus. Mast. in Hook. fil. Fl. Br. Ind. i. 351, and Journ. Linn. Soc. xiv. 501; Beccari Malesia, iii. 230, t. xii. f. 1 to 5, xxxvi. f. 1 to 12; Kurz For. Fl. Burm. i. 131; DC. Prod. i. 480; Bl. Bijdr. 81; Koen. in Trans. Linn. Soc. vii. 266, t. 14—16; Roxb. Fl. Ind iii. 399. Miq. Fl. Ind. Bat. i. pt. 2, 167. Griff. Not. iv. 528; Ic. t. 596. Wall. Cat. 1842. —Rumph. Amb. i. 99, t. 29.

In all the provinces except probably the Nicobars, cultivated. Distrib. Malayan Archipelago.

2. D. LOWIANUS, Scortechini MSS. A tree 50 to 60 feet high; young branchlets and petioles and lower surface of midrib with rather large loose scales. *Leaves* narrowly elliptic-oblong, shortly acuminate; the base rounded, not attenuate; upper surface glabrous, the midrib puberulous, lower quite covered with adpressed scales, mostly minute, but a few larger and loose; main nerves 14 to 18 pairs, faint, sub-horizontal; length 4·5 to 5·5 in., breadth 1·5 to 2 in.; petiole ·5 in. stout. *Cymes* crowded on small tubercles on branches several years old, trichotomous, 3 in. in diam. and about as long. *Flower-pedicels* ·5 to ·75 in. long, angled, covered with loose coppery scales. *Flowers* 2 in. in diam.; bracts 2 or 3, ·5 in. long, broadly ovate, connate, deciduous. *Calyx* campanulate, its base sub-inflated, ·75 in. long, its mouth with 3 broad blunt, shallow teeth, glabrous inside, covered with large silvery scales outside. *Petals* 5, oblanceolate, glabrous inside, pubescent outside, 1·25 in. long. *Stamens* in 5 phalanges, dividing shortly above the base into about 8 processes each dividing at its apex into several short filaments, each bearing a single reniform anther with marginal dehiscence. *Ovary* broadly ovoid, densely covered with large loose scales, 5-celled with 4 ovules in each, biseriate. *Style* cylindric, tapering, pubescent: stigma capitate. Fruit unknown.

Perak. Scortechini No. 1969.

A species collected only once and named by the late lamented Father Scortechini in honour of Sir Hugh Low, representative of the British Government at Perak, and to whose enlightened help Malayan Botany owes very much. The species approaches *D. Zibethinus* in many respects.

3. D. MALACCENSIS, Planch. MSS. Mast. in Hook. fil. Fl. Br. Ind. i. 351. A tree; the young branches thin, very minutely adpressed-scaly. *Leaves* elliptic-lanceolate with acute apices; the base acute, sometimes slightly rounded; main nerves about 20 pairs, thin, almost horizontal; both surfaces shining, the upper glabrous, the lower very

minutely adpressed-scaly; length 5 to 6·5 in., breadth 1·5 to 1·8 in.; petiole ·5 in., scaly like the branches. *Peduncles* ·5 to 1 in. long, in fascicles from tubercles on the stem, angled, bifurcating at the apex and bearing two pedicellate flowers, sometimes bearing one or two pedicels below the apex: pedicels two or three times as long as the common peduncles, angled, loosely scaly. *Flowers* 2·5 to 3 in. long. *Bracts* 2, broadly ovate, acute, embracing the buds. *Sepals* 5, ovate-oblong, blunt, valvate, 1·25 in. long, glabrous internally but with numerous very loose scales externally. *Petals* nearly twice as long as the sepals, narrowly oblong, pubescent on both surfaces, the outer with a few loose scales. *Anthers* narrowly oblong, 1-celled, sessile in groups on the apices of groups of combined filaments which are again united into 5 phalanges which, for more than half their length, form a tube round the ovary and style. *Ovary* oblong, angled, densely covered with scales with long cylindric stalks and flat heads. *Style* shorter than the staminal tube, pubescent, slightly scaly. *Stigma* capitate. *Young fruit* globular, densely covered with subulate pubescent spines. *Ripe fruit* unknown. Mast. in Journ. Linn. Soc. xiv. p. 501, t. xiv. fig. 17 to 20: *Beccari Malesia*, iii. 237, t. xii. fig. 6 to 8.

Malacca; Griffith, Maingay (No. 212, Kew Distrib.) Distrib. Burmah.

This is known only from Malacca and Burmah. It is distinguished from *D. Perakensis*, which in other respects it much resembles, by the stalked scales on the ovary, and by the larger and looser scales on the leaves. Doubtless when ripe fruit of both is found, better characters will be yielded by it. Beccari's specimen No. 852, and the same distinguished botanist's Nos. 2190 and 2590 from Borneo, have been referred by Masters (Journ. Linn. Soc. l. c.) to this species. But Beccari (in *Malesia* iii. 238, 244) founded his species *D. affinis* on the former, and his *D. testitudinarum* on the two latter.

4. D. TESTITUDINARUM, Becc. Malesia, iii. p. 244, t. xiii and xiv. A tall tree bearing flowers only near the base of the trunk; young branches rather slender, minutely sub-adpressed scaly. *Leaves* narrowly elliptic-oblong or oblanceolate-oblong, acute or shortly acuminate, the margins (in var. 2) sometimes with a single wide shallow indentation, the base rounded; upper surface glabrous, the lower densely covered with sub-adpressed scales: main nerves 18 to 22 pairs, rather bold, subhorizontal: length 4·6 to 8·5 in. (only 2·5 to 3·5 in. in var. 1 and much longer and broader in var. 2); breadth 1·4 to 2·2 in.; petiole 6 to ·25 in., thickened at apex. *Flowers* 3 to 3·5 in. long, in short condensed bracteolate racemes from tubercles near the base of the trunk;

the axes, pedicels, bracteoles and bracts densely covered with large loose scales: bracts enveloping the buds 2, broadly ovate, blunt. *Sepals* 5, valvate, wide and saccate at the base, the apices narrowed, glabrous inside, densely covered outside with loose large scales. *Petals* narrowly oblong, obtuse, more than twice as long as the sepals. *Stamens* as in *D. Malaccensis*. *Ovary* oblong, densely covered with loose, flat, sessile scales. *Style* shorter than the stamens, pubescent, sparsely scaly. *Stigma* capitate. *Fruit* (according to Beccari) on long peduncles, globose, 4 in. in diam., with 4 or 5 slight superficial grooves, densely covered with short broad pyramidal spines. *Seeds* sub-ovate, obtuse, angled; the arillus short, thin, cup-shaped.

Perak; at low elevations, Kunstler, Wray. Distrib. Borneo.

Var. 1. *Pinangiana*, Becc. l. c. 246. Leaves narrowly lanceolate, acuminate, 2·5 to 3·5 in. long by ·6 to ·9 in. broad. *Flowers* smaller than in the typical form: fruit unknown.

Penang, at 2,500 feet; Curtis No. 293. This variety, of which only imperfect specimens have as yet been obtained, will probably, when full material shall be forthcoming, prove to be a distinct species.

Var. 2. *macrophylla*, King. *Leaves* 10 to 17 in. long, 2·5 to 5·5 in. broad, the edge sometimes with a single shallow indentation. Racemes 3 in. long, many-flowered, with numerous bracteoles.

Perak; Kunstler 7497, Wray 3397. No fruit of this variety has as yet been collected. Like the last, it may prove to be a distinct species.

5. D. WRAYII, King, n. sp. A large tree; young branches very slender and, like the petioles and under surface of midrib, covered with rather large adpressed pale brown scales. *Leaves* narrowly elliptic-oblong with caudate acuminate apex and rounded base; upper surface quite glabrous, lower closely covered with thin adpressed silvery scales smaller than these on the midrib; main nerves 10 to 12 pairs, sub-horizontal, faint: length 5·5 to 8·5 in., breadth 2 to 2·5 in., petiole ·75 in. *Flowers* nearly 2 in. long, from the branches; pedicels of individual flowers rather more than 1 in. long, with many large loose scales. *Bracts* 3, broadly ovate, connate. *Calyx* cup-shaped, the mouth with 5 broad, rather deep, sub-acute teeth; inside glabrous, outside covered with large adpressed silvery scales as are also the bracts. *Petals* 1·5 in. long, oblanceolate, or spathulate-clawed, the claw very narrow, pubescent on both surfaces but especially on the outer. *Stamens* in 5 phalanges united at the bases only, each phalange dividing into 5 or 6 processes at the apices of which are born about 8 narrow reniform anthers dehiscing by their edges. *Ovary* broadly ovoid, loosely scaly.

Style longer than the stamens, cylindric, pubescent, not scaly: stigma capitate. *Fruit* unknown.

Upper Perak at 300 feet; Wray.

The fruit of this is unknown. Mr. Wray describes the petals as pink. The caudate-lanceolate leaves of this are different from those of any other *Durio* of the Malayan Peninsula.

6. D. OXLEYANUS, Griff. Notul. iv. 531. A tree, the young branches, petioles and under surfaces of the midrib adpressed-lepidote. *Leaves* elliptic-oblong, rounded at base and apex; upper surface glabrous; the lower softly pubescent, not scaly except on the midrib, the 15 to 18 pairs of main nerves stout, sub-horizontal, prominent beneath; length 3·5 to 5 in., breadth 1·5 to 2 in., petiole ·5 in. *Flowers* about 1 in. in diam., in few-flowered scaly cymes from the smaller branches. *Involucral bracts* 2, broadly ovate, pubescent, sparsely and minutely scaly. *Calyx* cup-shaped, the mouth with 4 broad shallow rather blunt teeth, inside glabrous, outside with many large loose scales. *Petals* 4, oblanceolate or spathulate, little longer than the calyx, pubescent on both surfaces, not scaly. *Stamens* 20, shorter than the petals; 5 free and alternating with 5 phalanges of 3 each which are slightly united by the bases of their filaments: *anthers* solitary, drum-shaped, the de[illegible]cence circular. *Ovary* depressed-globular, 4-celled, densely stellate-hairy. *Style* cylindric, pilose; stigma capitate. *Fruit* unknown. Mast. in Hook. fil. Fl. Br. Ind. i. 351 and Journ. Linn. Soc. xiv. 501, t. xvi. fig. 13 to 16. Beccari Malesia, III, 252. *Neesia Griffithii*, Planch. MSS.

Malacca, Griffith No. 545. Maingay, No. 220, (Kew Distrib.)

This differs, as Beccari has well pointed out (Malesia l. c.), from the other species of *Durio* by the absence of scales from every part of the leaf except the petiole and midrib; by the single, not glomerulate, anthers; by the hairy, not squamose, ovary. Should the fruit when found also present differences, it may be desirable to create a new genus for this species.

9. BOSCHIA, Korth.

Trees. *Leaves* oblong, entire, scaly beneath. *Flowers* small, axillary. *Bracteoles* 2-3, connate at the base, deciduous. *Calyx* deeply 4-5 parted. *Petals* linear-ligulate, entire or laciniate. *Stamens* many, some free, others irregularly coherent, outermost without anthers; anthers globose, 1-celled, opening by a terminal pore, solitary, or in groups of 2-6. *Ovary* 3-5-celled, style elongate; ovules one or more in each cell. *Fruit* oblong, 3 to 5-celled, 3 to 5-valved, muricate. *Seeds* few, ovoid, half-covered by a fleshy, coloured, cup-shaped arillus; cotyledons foliaceous. Species 4: all Malayan.

1. B. Griffithii, Masters in Hook. fil. Fl. Br. Ind. i. 352. A tree 40 to 60 feet high; young branches rather slender, pale, minutely furfuraceous. *Leaves* oblong, or elliptic-oblong, or obovate-oblong, shortly and abruptly acuminate, slightly narrowed towards the rounded base; upper surface quite glabrous; the lower pale, very minutely pubescent, the midrib and nerves slightly scaly; main nerves 8 to 11 pairs, spreading, prominent beneath and dark coloured; length 5 to 6·5 in., breadth 1·5 to 2·25. in., petiole ·4 to ·6 in.: stipules linear, deciduous. *Flowers* ·75 in. in diam., solitary, or in 2 to 3-flowered cymes from the axils of leaves or of fallen leaves; pedicels shorter than the petioles, bracteolate. *Involucral bracts* 2, broadly-ovate, blunt, connate at the base, closely enveloping the buds; scaly externally, glabrous within. *Sepals* 4, ovate, spreading, pubescent on both surfaces, scaly also on the outer. *Petals* 4 to 8, nearly twice as long as sepals, linear or linear-spathulate, ·1 in. broad. *Stamens* very numerous, unequal, slightly united by the bases of the filaments: the outer without anthers, some flat resembling the petals, a few of the inner longer and bearing at their apices 1 to 4 oblong obovoid anthers which dehisce by an apical pore. *Ovary* ovoid, 3-celled, densely covered with peltate, fimbriate, long-stalked scales. *Style* as long as the longest stamens. *Stigma* subcapitate. *Fruit* oblong, pointed at each end, 1·5 to 2 in. long, densely covered with sharp stout conical spines, 3-celled, dehiscent. *Seeds* 3 to 6, or fewer. Mast. in Journ. Linn. Soc. xiv. t. xv, fig. 29 to 39, t. xvi., fig. 40 to 42. *Beccari Malesia* III, p. 256. *Heteropyxis*, Griff. Not. iv. 524; Ic. Pl. As. t. 594.

Malacca; Griffith, Maingay. Perak, very common. Distrib. Sumatra, Forbes, No. 3068.

10. Neesia, Blume.

Trees. *Branches* marked with large leaf-scars. *Leaves* entire, pinnate-veined. *Stipules* leafy. *Cymes* from the stem in the axils of the fallen leaves. *Bracteoles* 3, connate into a cup, deciduous, covered, like the sepals, with peltate scales. *Calyx* ventricose, conical above, opening by a circular irregularly crenulate orifice at the top, ultimately dilated and cushion-shaped at the base. *Petals* 5, free, imbricate. *Stamens* numerous, the filaments more or less united; anthers 2-celled, opening lengthwise, connective thick; staminodes 0. *Ovary* oblong, 5-celled; style short; stigma capitate; ovules numerous, 2-seriate, horizontal, anatropous. *Fruit* ovoid, woody, muricate, loculicidally 5-valved. *Seeds* albuminous; aril 0; cotyledons flat, leafy. Distrib. Seven species, all Malayan.

N. SYNANDRA, Mast. in Hook. fil. Fl. Br. Ind. i. 352. A tree 70 to 100 feet high; young branches stout, their bark dark lenticellate and with large cicatrices. *Leaves* large, crowded near the apices of the branches, coriaceous, oblong-elliptic to obovate-elliptic: the apex rounded, emarginate; the edges sub-undulate, slightly narrowed in the lower third to the sub-cordate base; upper surface glabrous, lower puberulous; nerves 13 to 22 pairs, spreading, stout and distinct on both surfaces, the reticulations also distinct; length 7 to 16 in., breadth 3·5 to 8 in.; petiole 1·5 to 3 in., thickened at base and apex; stipules foliaceous, with very stout midribs, 1·5 to 2·5 in. long. *Cymes* short (1·5 in. long), crowded, dichotomous, 8 to 12-flowered, from the axils of sub-apical fallen leaves; the pedicels short, scaly. *Flowers* about ·6 in. long. *Bracts* connate into a 3-lobed cup surrounding the base of the flowers. *Calyx* ventricose with a contracted irregularly and minutely toothed mouth, densely pubescent inside, scaly outside as are the bracts, ultimately involute so as to form an annular cushion ·5 in. or more in diam. *Petals* 5, free, much imbricate, ovate-lanceolate, glabrous. *Stamens* numerous, the filaments more or less connate at the base, unequal; anthers sub-globular, 2-celled. *Ovary* conical, sessile, densely pilose, not scaly: style slightly longer than the ovary; stigma capitate, 5-angled. *Fruit* 6 to 8 in. long and 4 to 5 in. in diam., ovoid-conic, pedunculate, with 5 bold rounded vertical angles: the pericarp very thick, woody, externally covered with stout pyramidal sharp spines, internally lined with a dense layer of stiff yellow hair; 5-celled, dehiscent. Mast. in Journ. Linn. Soc. xiv. p. 504. *Beccari Malesia*, iii. 263.

Malacca, Maingay. Perak; Scortechini, Wray, King's Collector.

I have seen no specimens of the plant (*N. altissima*) on which Blume founded this genus. But, judging from his admirable description and fine coloured figure (Nov. Act. Acad. Caes. xvii. 83, t. vi), this species must be very closely allied to that. I find the stamens of this agree both with Blume's description above referred to, and with Sig. Beccari's, in his admirable and splendidly illustrated monograph in *Malesia* iii. pp. 258 to 268. Ripe fruit and seeds of this are as yet unknown.

11. CŒLOSTEGIA, Benth.

Tall trees. *Leaves* simple, entire, scaly beneath. *Flowers* small (scarcely ·25 in. in diam.), cymose; the inflorescence, bracts and calyx scaly. *Bracts* connate into a toothed cup. *Calyx* with constricted tube, pouched above and constricted at the apex into 5 connivent lobes. *Petals* 5, free, inserted near the apex of the calyx tube, connivent. *Stamens* numerous; the filaments short, thick, slightly connate at the base, the apex constricted; the anthers globose, 3 to 4-celled. *Ovary* partly immersed in the calyx-tube, globular or sub-globular, 5-celled; the ovules few, erect. *Style* short; stigma peltate, discoid, large. *Fruit* large, woody, muricate externally, hairy within, 5-celled, few-seeded, dehiscent. Three species; all Malayan.

C. Griffithii, Benth. in Benth. & Hook. fil. Gen. Plant. i. 213. A tree; the young branches rather slender, dark-coloured, striate, minutely and deciduously scaly. *Leaves* coriaceous, oval, shortly and bluntly acuminate, the base rounded; upper surface glabrous, lower sparsely adpressed-scaly; main nerves about 8 pairs, spreading, faint; length 2·4 to 3·75 in., breadth 1·25 to 1·6 in.; petiole ·5 to ·75 in., minutely adpressed-scaly. *Inflorescence* of fasciculate cymose racemes about 2 in. long, from the axils of fallen leaves, many-flowered; pedicels longer than the flowers. *Flowers* ·25 in. in diam., scaly. *Bracts* connate into a 3-lobed cup less than half as long as the calyx. *Calyx* constricted at the base, then dilated into a 5-pouched sac which is contracted and 5-toothed at its apex. *Petals* 5, distinct, inserted on the calyx at the apex of its tube, triangular, acute, connivent, fleshy, glabrous. *Stamens* numerous, attached to the petals; the anthers small, globose, 3 or 4-celled. *Ovary* globular-obovate, densely covered with large loose scales. *Style* shorter than the ovary; stigma peltate, thick, its edges wavy. *Fruit* unknown. Mast. in Hook. fil. Fl. Br. Ind. i. 353 and Journ. Linn. Soc. xiv. 505, t. xvi, figs. 43 to 50. *Beccari Malesia*, iii. 270.

Malacca, Griffith; Perak, Scortechini, King's Collector.

Fruit was not known when this genus was first established by the late Mr. Bentham; and, of this species, fruit is still unknown. Sig. Beccari has, however, discovered two species in Sumatra and Borneo (*C. Sumatrana* and *Borneensis*) the fruit of which he describes and figures (*Malesia*, iii. 271, t. xxvii. to xxix); and from his description the generic description has been completed.

Order XVIII. STERCULIACEÆ.

Herbs, shrubs or trees; herbaceous portions usually more or less stellate-pubescent. *Bark* usually abounding in mucilage, inner fibrous. *Leaves* alternate, simple, often lobed, stipulate. *Inflorescence* axillary, rarely terminal, usually cymose. *Flowers* regular, uni- or bi-sexual. *Sepals* 5, often connate. *Petals* 5 or 0. *Andrœcium* columnar or tubular, of many stamens; or stamens rarely few, free; anthers in heads, or in a single ring at the apex of the column, or dispersed on the outside of the tube, or arranged along the edge of a cup or tube, with intervening staminodes or sterile stamens; anther-cells always 2, parallel or divergent. *Ovaries* 2 to 5, free, rarely 1, sessile or stalked; styles slightly united and becoming free or slightly coherent, as many as the ovaries. *Ovules* many or few, attached to the inner angles of the ovaries, anatropous, ascending or horizontal, raphe ventral or lateral. *Fruit* dry or fleshy, dehiscent or indehiscent. *Seeds* sometimes arillate, albuminous or exalbuminous: cotyledons leafy, flat, folded or convolute; radicle short, inferior, pointing towards, or remote from the hilum. Distrib. Abundant in the tropics of either hemisphere and in subtropical Africa and Australia. Genera 40—45; species from 500 to 600.

Tribe I. *Sterculieæ. Flowers* unisexual or polygamous. *Petals* 0. *Andrœcium* columnar; the anthers clustered at its apex; or in a 1-seriate ring.
Anthers numerous.
Ovary with 2 or more ovules in each cell; fruit dehiscent ... ... 1. *Sterculia.*
Ovarian cells 1-ovuled; fruit indehiscent 2. *Tarrietia.*
Anthers 5, whorled; fruit indehiscent. 3. *Heritiera.*

Tribe II. *Helictereæ. Flowers* hermaphrodite. *Petals* deciduous. *Andrœcium* columnar below, dilated above into a cup, margin bearing on it the anthers usually alternating with staminodes.
Capsule membranous, inflated... ... 4. *Kleinhovia.*
Capsule more or less woody, not inflated.
Anther-cells divaricate; seeds not winged 5. *Helicteres.*
Anther-cells parallel; seeds winged ... 6. *Pterospermum.*

Tribe III. *Hermannieæ. Flowers* hermaphrodite. *Petals* marcescent, flat. *Andrœcium* tubular at the base only; stamens 5, staminodes 0.
Ovary 5-celled ... ... 7. *Melochia.*
Ovary 1-celled, 1-seeded ... ... 8. *Waltheria.*

Tribe IV. *Buettneriæ. Petals* concave or unguiculate at the base; filaments in a tube with the anthers at its apex, solitary or in groups between staminodes.
Stamens in a single series.
Stamens in groups between the staminodes;
Petals unguiculate ... ... 9. *Abroma.*

Stamens solitary between the staminodes.
Petals unguiculate, with 2 lateral lobes and a long subterminal appendage ... ... 10. *Buettneria.*
Petals linear not lobed, concave not unguiculate at the base ... 11. *Commersonia.*
Stamens in several series ... ... 12. *Leptonychia.*

1. STERCULIA, Linn.

Trees or shrubs. *Leaves* simple, entire or palmately lobed, sometimes digitately compound. *Inflorescence* panicled or racemose, usually axillary and crowded towards the apices of the branches. *Flowers* male and hermaphrodite. *Calyx* campanulate or rotate, 4-5 lobed, often coloured. *Petals* 0. *Staminal column* bearing a head or ring of usually sessile, 2-celled, anthers at its apex, the cells often divergent. *Carpels* 5, distinct or slightly cohering, 2 to many-ovuled, borne on the apex of a more or less elongated gynophore; styles more or less connate: stigmas free or united so as to form a peltate lobed disc. *Ripe carpels* distinct, spreading, sessile or stalked, follicular, from membranous to woody, with several (rarely many) seeds; or navicular with a single seed. *Seeds* 1 to many, sometimes winged, rarely arillate; albumen bipartite, flat or lobed: cotyledons thin flat and adherent to the albumen, or fleshy; radicle near to or remote from the hilum. Distrib. About 70 species tropical and chiefly Asiatic.

Sect. I. *Eusterculia*, Endl. *Follicle* coriaceous or woody. *Seeds* two or more.
Leaves simple, orbicular or reniform.
Leaves lobed.
Follicles glabrous within, the edges only ciliate; gynophore and staminal tube glabrous ... ... 1. *S. villosa.*
Follicles hispid-pilose within; gynophore and staminal tube hairy ... 2. *S. ornata.*
Leaves not lobed ... ... 3. *S. macrophylla.*
Leaves simple, longer than broad; not orbicular or reniform.
Leaves quite glabrous.
Calyx-lobes not cohering by their apices ... ... 4. *S. laevis.*
Calyx-lobes cohering by their apices.
Flowers in racemes: nerves of leaves 6 pairs or fewer ... 5. *S. hyposticta.*

Flowers in panicles: nerves of leaves more than 6 pairs

Leaves narrowly oblong-lanceolate; follicles 1 to 1·25 in. long ... ... 6. *S. parvifolia.*

Leaves ovate or obovate-oblong to narrowly elliptic.

Ovaries 3, villous: stamens 7 7. *S. Kunstleri.*

Ovaries 5, scaly; stamens 10 8. *S. parvifolia.*

Leaves more or less hairy.

Calyx-lobes not cohering by their apices: leaves glandular-dotted beneath ... ... 9. *S. Scortechinii.*

Calyx-lobes slightly cohering by their apices: leaves white beneath ... 10. *S. bicolor.*

Calyx-lobes spreading, connivent and cohering by their apices.

Stigmas free, long, recurved ... 11. *S. augustifolia.*

Stigmas united into a lobed disc.

Leaves more or less obovate 12. *S. rubiginosa.*

" lanceolate ... ... 13. *S. ensifolia.*

Species of uncertain position... ... 14. *S. pubescens.*

Sect. II. *Firmiana*, Marsili; Br. in Benn. Pl. Jav. Rar. 235 (gen.). *Follicles* membranous, opening long before maturity. *Seeds* two or more.

Calyx ·75 in. long: staminal tube about the same length; adult leaves glabrous... 15. *S. colorata.*

Calyx 1·25 in. long, staminal tube ·5 in. longer: adult leaves minutely stellate-pubescent ... ... 16. *S. fulgens.*

Sect. III. *Pterygota*, Endl. (gen.). *Follicles* woody. *Seeds* many, winged at the apex ... 17. *S. alata.*

Sect. IV. *Scaphium*, Endl. *Anthers* 15, (sometimes 10). *Stigmas* lobed. *Follicles* large, membranous, boat-shaped, often gibbous, opening long before maturity, containing only 1 seed near the base.

Leaves ovate-rotund, deeply cordate ... 18. *S. linearicarpa.*

Leaves ovate to ovate-oblong: main nerves 2 to 4 pairs ... ... 19. *S. scaphigera.*

Leaves elliptic-oblong: main nerves 6 to 7 pairs ... ... 20. *S. affinis.*

Sect. V. *Pterocymbium*, Br. in Benn. Pl. Jav. Rar. 219 (gen.). *Flowers* sub-hermaphrodite. *Anthers* 10. *Styles* coherent, stigmas recurved. *Follicles* 4—6, membranous, opening long before maturity. *Seed* solitary.

Leaves broadly ovate, acuminate, the base deeply cordate ... ... 21. *S. campanulata.*

Leaves elliptic-oblong; the base broadly rounded or sub-truncate, not cordate... 22. *S. tubulata.*

1. S. VILLOSA, Roxb. Hort. Beng. 50. A tree 30 to 60 feet high: young branches thick, their apices tawny-tomentose and enveloped by the large sub-caducous stipules, the bark pale with large leaf-cicatrices. *Leaves* thickly membranous, rotund or reniform, with 5 to 7 broad abruptly acuminate often toothed lobes, the sinuses between the lobes acute; the base deeply cordate, the basal lobes rounded: upper surface at first minutely stellate-pubescent, ultimately glabrous, except the 5 to 7 radiating tomentose nerves: under surface uniformly and minutely tomentose; length and breadth from 12 to 18 inches: petiole deciduously densely pubescent, about as long as the blade: stipules ovate-lanceolate, acuminate, with cordate bases, pubescent, sub-caducous. *Panicles* from the axils of the previous year's leaves, solitary, from 6 to 12 in. long: branches short, many-flowered, tomentose. *Calyx* campanulate, ·4 in. in diam., with 5 ovate acute spreading lobes as long as the tube, yellowish with purple fundus, veined, puberulous outside especially towards the base, almost glabrous inside. *Male flower;* staminal column longer than the calyx-tube, slightly curved, quite glabrous, bearing at its apex 10 sub-sessile anthers with thick connective and 2 divergent cells. *Female flower;* gynophore glabrous, thickened above; ovaries 5, conjoined, tomentose; styles conjoined, puberulous, curved; stigma small, lobed. *Follicles* 3 to 5, coriaceous, sessile, bright red when ripe, oblong, tapering to both ends; 2 to 2·5 in. long by 1 in. broad; shortly hispid-pubescent externally, smooth and shining internally and glabrous except along the placental edges which are strongly ciliate. *Seeds* 6 or more, oval, smooth. Roxb. Fl. Ind. i. 153; Kurz For. Fl. Burm. i. 136; Mast. in Hook. fil. Fl. Br. Ind. i. 355; Pierre Fl. Forest. Coch-Chine, t. 185, fig. D.; Wall. Cat. 1136, 2, 3, D.; W. & A. Prodr. i. 63; Dalz. & Gibs. Bomb. Fl. 22; Br. in Benn. Pl. Jav. Rar. 227.

Andamans, Prain. Distrib. British India.

2. S. ORNATA, Wall. in Herb. Calcutta. A tree 20 to 30 feet high: young branches thick, glabrous, pale, the leaf-cicatrices very large, the apices deciduously pilose, coccineous drying into brown. *Leaves* thickly membranous, reniform, more or less deeply divided into 5 or 7 acuminate lobes, the sinuses between the lobes wide, the base deeply cordate; upper surface minutely strigose, often stellate, minutely pitted; lower surface yellowish-brown, minutely and uniformly tawny-tomentose, minutely glandular-dotted under the hair; the 5 to 7 radiating main nerves and the ascending secondary nerves bold and distinct; length about 12 in., breadth about 15 in.; petiole 15 to 18 in. long, thickened at the base, minutely tomentose. *Panicles* from the axils of the previous year's leaves, solitary, 8 to 15 in. long, shortly branched, many-flowered, pulverulent reddish-tomentose. *Calyx* ochre-coloured with red fundus, veined, widely campanulate, sub-rotate, with 5 ovate acute spreading lobes longer than the tube, stellate-pubescent externally, puberulous internally; ·75, in. in diam. *Male flower;* gynophore about as long as thetube, curved, sparsely glandular-hairy, bearing at its apex 10 small anthers with thick connective. *Female flower;* gynophore thickened above, densely tawny-tomentose as are the conjoined ovaries and curved style; the ovaries with a ring of about 10 sessile anthers at their base; stigma discoid, rugulose, 5-lobed. *Follicles* about 5, sessile, coriaceous, narrowly oblong, very shortly beaked, brilliant orange scarlet when ripe, outside glabrescent, inside densely coccineous-pilose; length 4 in., breadth 1·25 in. *Seeds* about 6, oval, smooth. Wall. in Voigt Hort. Calc. Suburb. 105 (*name only*); Kurz Journ. As. Soc. Beng. Vol. xlii. pt. 2, p. 258; Vol. xliii. pt. 2, p. 116; For. Fl. Burm. i, 136. *Sterculia armata*, Mast. in Hook. fil. Fl. Br. Ind. i. 357, *in part*. Pierre Fl. Forest. Coch-Chine, t. 185, fig. C.

Burmah; Wallich, Brandis, Kurz. Andamans, Kurz.

I include this species because, although the evidence of its having been collected in the Andamans is not very good, I think it extremely likely that it does occur there, and that good unmistakeable specimens will soon be forthcoming. The species in many respects resembles *S. villosa*, with which it appears to have often been confused. The distinctive marks to separate it from *S. villosa* are that the leaves are minutely dotted and pitted; that the apices of the young branches have red hairs (becoming brown on drying); that after the hairs have fallen the young branches have pale polished bark with very large leaf-cicatrices and some warts, but no sub-persistent stipules; that the flowers are larger (·75 in. in diam. as against ·4 in); that the staminal column and gynophore are hairy; that the follicles are larger and paler; and that the whole of their inner surface is densely hispid-pilose.

3. S. MACROPHYLLA, Vent. Hort. Malm. ii. No. 91 (in note). A tree 80 to 120 feet high; young branches very thick, rough from the leaf cicatrices, the apices deciduously rufous or tawny-pilose. *Leaves* sub-coriaceous, broadly ovate to ovate-rotund or obovate-rotund, entire, narrowing to the slightly cordate 7-nerved base; upper surface sparsely and rather minutely pubescent, some of the hairs 2-branched, becoming glabrescent with age, the midrib and nerves always pubescent; under surface sub-tomentose, tawny, the midrib and 6 to 8 pairs of lateral nerves prominent, rufous-villose; transverse venation distinct, rather straight; length 8 to 16 in., breadth 6 to 12 in., petiole 3·6 to 6 in., softly hairy, tawny. *Panicles* solitary, axillary, nearly as long as the leaves, much-branched, many-flowered, hispidulous-pubescent, capillary, shorter than the flowers. *Flower-buds* minute, sub-globose. *Calyx* ·15 in. long, campanulate, stellate-hairy, 5-lobed; the lobes triangular, erect, shorter than the tube. *Follicles* 3 to 5, shortly stalked, woody, sub-rotund, about 2·25 in. each way, crimson when ripe, outside pubescent and longitudinally rugose; inside smooth. *Seeds* oblong, black, smooth, ·75 in. long. Mast. in Hook. fil. Fl. Brit. Ind. i. 356; R. Brown in Benn. Pl. Jav. Rar. 230.

Malacca; Maingay No. 233 (Kew Dist.). Perak; at elevations of 200 to 500 feet; King's Collector Nos. 6052 and 7923; Scortechini, No. 230. Distrib. Java, Brit. North Borneo.

4. S. LAEVIS, Wall. Cat. 1138. A shrub or small tree; young branches rather thin, with pale striate bark, the apices deciduously rusty-puberulous. *Leaves* membranous, narrowly ovate-oblong, sometimes slightly obovate, the apex shortly and bluntly acuminate; the base tapering, acute, rarely rounded, faintly 3-nerved: both surfaces glabrous, shining, the midrib and 6 to 9 pairs of spreading nerves prominent on the lower: length 4·5 to 9 in., breadth 2 to 3 in.; petiole 1·1 to 2·5 in., smooth, thickened at the apex. *Panicles* meagre, solitary, axillary, slender, puberulous, shorter than the leaves, few-flowered; pedicels about as long as the flowers. *Flower-buds* oblong. *Calyx* ·5 in. long or more, pubescent on both surfaces but especially on the inner; the tube urceolate, divided at its apex into 5 linear-oblong sub-acute ascending lobes, longer than the tube, slightly connivent but not cohering by their apices, hispidulous on their inner surface. *Male flower;* staminal column shorter than the tube, glabrous; anthers 10, sessile at its apex, elongate-ovate. *Hermaph. flower:* gynophore very short; ovaries 5, boat-shaped, rusty-pubescent, sub-sessile, with a ring of 10 sessile anthers at their base outside: styles almost obsolete; stigmas 5, cylindric, free, radiating, recurved, pubescent beneath. *Follicles* 3 to 5, coriaceous, narrowly

oblong, with short straight beaks, bright red when ripe, puberulous externally, slightly curved, glabrous, shining and ridged internally, 2 in. long and about ·5 in. broad. *Seeds* 3 or 4 oblong, black, shining. Mast. in Hook. fil. Fl. Br. Ind. i. 357. Pierre Fl. Forest. Coch-Chine t. 192, figs. 1 to 7; Br. in Benn. Pl. Jav. Rar. 230; Miq. Fl. Ind. Bat. i. pt. 2, 174. *S. coccinea*, Jack Mal. Misc. i. 286, not of Roxb.

Penang, Perak, Malacca, Singapore: at low elevations: but not common.

5. S. HYPOSTICTA, Miq. Fl. Ind. Bat. Suppl. 399. A shrub or small tree, all parts glabrous except the inflorescence: young branches slender, dark and smooth becoming (by the falling off of the bark) pale and striate. *Leaves* membranous, oblong, to oblong-lanceolate, sometimes slightly obovate, abruptly acuminate or even caudate-acuminate, entire, the base slightly narrowed and rounded, or not narrowed and truncate, emarginate, rarely acute, 3-nerved; both surfaces glabrous, shining: lateral main nerves 3 to 5 pairs, spreading, curved, inarching far from the margin, prominent beneath: length 3·5 to 5·5 in., breadth 1·5 to 2·25 in., petiole 1 to 1·5 in., thickened at base and apex. *Racemes* axillary, solitary, drooping, longer than the leaves, minutely whitish pubescent, with superficial brown stellate hairs: bracteoles linear, longer than the pedicels. *Calyx* with narrowly campanulate tube ·25 in. long, densely rufous-pubescent externally and glabrous inside: lobes 5, not quite so long as the tube, linear, spreading, connivent, cohering from some time by their tips, the edges recurved, glandular-pilose inside, sub-pubescent outside. *Male flower;* staminal column short, glabrous, with 8 sessile oblong 2-celled anthers at its apex. *Female flower:* gynophore short; ovaries 4, ovoid, conjoined, shortly tomentose, with ring of 8 sessile anthers at their base. *Style* simple, curved, sparsely villous; stigma large, glabrous, with 4 fleshy oblong-obovoid curved lobes. *Follicles* 2 or 3, coriaceous, bright red when ripe, narrowly oblong, tapering to each end, 2 to 2·25 in. long and ·65 in. broad; externally minutely rusty-pubescent; internally glabrous, wrinkled. *Seeds* 4, oblong, pointed, black. Kurz in Journ. As. Soc. Beng. Vol. xlv. pt. 2, p. 120.

Perak; King's Collector, Wray. Nicobars, Kurz.

6. S. PARVIFOLIA, Wall. Cat. 1123. A tree 20 to 30 feet high: young branches slender, striate, the older pale, the younger dark-coloured, glabrous. *Leaves* membranous, drying of a pale green, oblong-lanceolate, rarely ovate-oblong, bluntly acuminate, entire; the base acute or rounded, faintly 3-nerved; both surfaces glabrous: main nerves 6 to 8 pairs,

spreading, rather prominent on both surfaces as is the midrib: length 4 to 6·5 in., breadth 1 to 1·75 in.; petiole 1 to 1·75 in., smooth, slender, thickened at the apex. *Racemes* solitary, axillary, much shorter than the leaves, few-flowered, glabrous; flower-pedicels shorter than the flowers, capillary. *Flower-buds* oblong. *Calyx* less than ·5 in. long, glabrescent externally, puberulous internally especially on the lobes; tube wide, cylindric, with 5 linear-lanceolate lobes about as long as itself, spreading, incurving and joined for some time by their tips. *Male flower:* staminal column shorter than the tube and bearing at its apex about 12 small oblong anthers with thick connective and diverging cells. *Herm. flower:* gynophore very short, glabrous; ovaries 5, broadly ovate, rusty-pubescent; styles united, recurved, with many white spreading hairs: stigmas clavate, flattened, recurved, spreading. *Follicles* 3 to 5, broadly oblong, with a straight beak, 1 to 1·25 in long, ·6 in. broad. *Seeds* 2, broadly ovoid, black, shining. Mast. in Hook. fil. Fl. Br. Ind. i. 356; R. Brown in Benn. Pl. Javan. Rar. 229; Miq. Fl. Ind. Bat. Vol. i. pt. 2, p. 173.

Penang, Perak, Malacca.

Closely allied to *S. laevis*, Wall.: but with smaller flowers and follicles, and with calyx lobes coherent at their tips.

7. S. KUNSTLERI, King, n. sp. A tree 30 to 60 feet high; all parts (except the inflorescence and the tips of the young branches) glabrous; branches with pale smooth striate bark. *Leaves* thinly coriaceous, broadly ovate (or slightly obovate) to oblong or narrowly elliptic, the apex rounded, blunt, sub-acute or very shortly and sub-abruptly acuminate; slightly narrowed to the rounded or sub-truncate, rarely acute, 3 to 5-nerved, base; both surfaces shining; lateral nerves about 7 to 9 pairs, spreading, slightly prominent beneath: length 4 to 9 in., breadth 2 to 4·5 in.; petiole ·75 to 2·75 in., slender, glabrous. *Panicles* solitary, narrow, in the axils of (and shorter than) the mature leaves, or supra-axillary, slender; the lateral branches short, 1-to 3-flowered, flocculent-tomentose, rusty; bracteoles lanceolate to ovate, caducous. *Calyx* ·3 to ·35 in. long, the tube urceolate, densely stellate-tomentose outside, sub-glabrescent inside; lobes 5, shorter than the tube, linear-lanceolate, villous on the inner surface, tomentose on the outer, spreading, connivent and slightly coherent by their tips. *Male flower:* staminal column slender, shorter than the calyx-tube, curved, bearing at its apex 5 to 7 sessile broad anthers. *Hermaph. flower:* gynophore short; ovaries 3, ovoid, villous, with a ring of adpressed sessile oblong anthers at their base: styles distinct, short, thin, sparsely villous; stigmas thick, fleshy, clavate, bent (outwards) on themselves. *Follicles* 2 or 3,

woody, from peach-coloured to carmine when ripe, oblong, rounded at at the base, the apex acute and slightly curved; externally rugose (the rugae mostly longitudinal), minutely tomentose, inside smooth; length 3 to 3·5 in., breadth 1·25 to 1·5 in. *Seeds* narrowly ovoid, nearly 1 in. long, black.

Perak; King's Collector Nos. 3259, 7211, 7245, Scortechini No. 1805; at 100 to 300 feet elevation. Distrib. Sumatra; Forbes, No. 2679.

In externals this species closely resembles *S. parviflora*, Roxb. But, after numerous dissections, I conclude that the two species are quite distinct. The ovaries of this are never more than 3, and they are always densely villous; those of *parviflora* are invariably 5, and they are scaly, not villous. The stigmas of this are long and are bent outwards on themselves; these of *parviflora* are short and recurved outwards from their junction with the styles: they are not bent on themselves. The follicles of this are thicker and more woody and the seeds are larger than those of *S. parviflora*. Moreover this has never more than 7 stamens, while *S. parviflora* has 10. The leaves of this are rather thicker in texture and the young branches are thinner and paler than those of *S. parviflora*.

8. S. PARVIFLORA, Roxb. Hort. Beng. 50. A tree 20 to 50 feet high; young branches rather thick; the tips ferruginous-tomentose; the bark pale, rough, glabrous. *Leaves* membranous, oval, ovate or obovate-oblong, the apex rather abruptly shortly and bluntly acuminate, entire; the base rounded and slightly cordate, or sub-truncate and emarginate, 5-nerved; both surfaces glabrous, but not shining; the midrib and 7 or 8 pairs of spreading rather prominent lateral nerves sparsely stellate-pubescent on the lower when young; length 4 to 10 in., breadth 2 to 5·5 in.; petiole 1 to 4 in., deciduously rufous-tomentose. *Panicles* about as long as the leaves, slender, the lateral branches short and the flower-pedicels capillary, everywhere covered with rusty stellate tomentum, ebracteolate. *Calyx* ·2 in. long with an urceolate tube, the mouth with 5 linear-lanceolate lobes almost as long as the tube, incurved and united by their apices, stellate-tomentose externally, glabrous within. *Male flower:* staminal column shorter than the calyx-tube, bearing at its apex 10 sessile short narrowly ovate anthers with thick connective. *Herm. flower:* ovaries 5, ovoid, scaly, with a ring of anthers at their base: ovules 4 or 5. *Styles* slightly united, slender, sparsely villous, short; stigmas united into a fleshy boldly 5-lobed disc, but easily separable into 5 fleshy flattish recurved stigmas. *Follicles* 1 to 5, thickly coriaceous, brilliant red to orange, pubescent to glabrescent, oblong, shortly beaked, 2·5 to 3·5 in. long and 1·25 to 1·5 in. broad; inside glabrous, shining,

boldly ridged. *Seeds* broadly ovoid, black, ·6 in. long, smooth. Roxb. Fl. Ind. iii. 147; Brown in Bennett Pl. Jav. Rar. 232: Wall. Cat. 1121. Kurz For. Fl. Burm. i. 138. Pierre Fl. Forest. Coch-Chine, t. 195 F. *S. Maingayi*, Mast. in Hook. fil. Fl. Br. Ind. i. 359; Pierre Fl. Forest. Coch-Chine, t. 188 A.

Penang, Malacca, Perak; at low elevations, common. Distrib. Burmah and Sylhet in British India; Cochin China.

After careful dissection of the flowers of the types of the two species *S. parviflora*, Roxb. and *S. Maingayi*, Masters, and of flowers of many other specimens, I can come to no other conclusion than that they are one and the same. There is a curious tendency to inequality in size in the leaves, some being twice as large as others rising from the same twig within the distance of an inch. And the panicles usually follow the leaves in the matter of length.

9. S. SCORTECHINII, King, n. sp. A tall tree; young branches rather thick, their bark pale, rough, the youngest parts deciduously rusty-pubescent. *Leaves* thinly coriaceous, oblong, slightly obovate, the apex rounded, with an abrupt short blunt point, entire; the base slightly narrowed, rounded or minutely cordate, 3-nerved; upper surface glabrous, shining; the lower slightly paler, dull, thickly dotted with minute reddish flat shining glands, the midrib and 4 to 5 pairs of prominent ascending lateral nerves stellate-pubescent: length 2·5 to 3·5 in., breadth 1·25 to 1·65 in.; petiole ·65 to 1 in., deciduously pulverulent-tomentose. *Panicles* racemes-like, axillary, solitary, shorter than the leaves, densely pulverulent-tomentose, rusty; pedicels as long as the buds: bracteoles ovate, ·25 in. long, imbricate, caducous. *Calyx* campanulate, divided almost to its base into 5 broadly ovate spreading not connivent lobes, pubescent-tomentose both internally and externally *Male flower:* staminal column shorter than the calyx, crowned by about 10 short anthers with thick sub-cuneate connective and short divergent cells. *Herm. flower: Ovary* 3-celled, obliquely ovoid, pubescent-scaly; ovules 3 or 4 in. each cell. *Styles* connate, pubescent. *Stigmas* 3, large, ovoid, spreading, glabrous, dark-coloured. *Follicles* not seen.

Perak; Scortechinii, No. 2068.

Collected only once, and without fruit.

10. S. BICOLOR, Mast. in Hook. fil. Fl. Br. Ind. i. 359. A tree 40 to 60 feet high: young branches rather thin, cinereous, striate, glabrous, rufous-pubescent at the very tips. *Leaves* small, membranous, obovate-oblong, acute or shortly mucronate, entire, slightly narrowed to the minutely 2 to 3-nerved rounded base; upper surface glabrous

when adult, with a few small scattered white stellate hairs when young; under surface pale from a layer of minute whitish hairs, the midrib and 16 to 18 pairs of sub-horizontal lateral nerves rufous-tomentose; length 2·5 to 3 in., breadth 1·2 to 1·4; petiole about 1 in., slender, scaly-tomentose. *Panicles* about as long as the leaves, slender, in the axils of young leaves, pulverulent-tomentose, sub-ferruginous; branches short, spreading. *Calyx* pedicellate, ovoid-oblong, pointed in bud, when adult ·3 in. long, widely campanulate, with 5 linear incurved pubescent lobes as long as the tube. *Staminal column* shorter than the tube, glabrous; anthers about 12, sessile at the apex of the column, their connective thick, cuneate, the cells divergent. *Follicles* unknown.

Malacca; Maingay, No. 230 (Kew Distrib.) Perak. Wray, No. 2378.

Recognisable at once by its small leaves, white beneath. The figure named *S. bicolor*, Mast. by Pierre (Fl. Forest. Coch-Chine t. 187) agrees neither with M. Pierre's own description of it; nor with Masters' type-specimen. There may probably have been some printer's blunder in the matter.

11. S. ANGUSTIFOLIA, Roxb. Hort. Beng. 50. A small tree: young branches densely velvetty rusty-tomentose; ultimately rather pale, glabrous, warted and striate. *Leaves* membranous, oblong-lanceolate rarely ovate-lanceolate, acuminate or acute, entire, slightly narrowed to the rounded 3-nerved base: upper surface glabrous, the lower more or less densely and softly rusty-tomentose: length 4 to 7 in., breadth 1·25 to 2·25; petiole ·6 to 1·1 in., rusty-tomentose. *Panicles* solitary, axillary, crowded at the apices of the branches, lax, drooping, longer than the leaves, everywhere densely rusty-tomentose; pedicels much longer than the ovate pointed buds. *Calyx* ·2 in. in diam., hispidulous-pubescent everywhere except the tube which inside is glabrous, deeply divided into 5 linear-lanceolate lobes; the lobes longer than the tube, spreading, connivent, cohering by their tips, their edges recurved. *Male flower:* staminal column as long as the tube, glabrous, recurved, bearing at its apex 10 oblong sessile anthers with large connective, the cells slightly divergent. *Herm. flower:* gynophore short, glabrous: ovaries 5, ovoid, rusty-tomentose with a ring of 10 sessile anthers at their base: style short, sparsely pilose: stigmas much longer than style, fleshy, spreading, recurved. *Follicles* 4 or 5, ovate-oblong with a short curved beak, 2·75 in. long and 1·35 in. broad, densely but minutely velvetty rusty tomentose outside, smooth shining and rugose inside and with a few small scattered whitish hairs. Roxb. Fl. Ind. iii. 148. Pierre Fl. For. Coch-Chine, t. 190; Wall. Cat. 1133; R. Brown in Benn. Pl. Jav.

Rar. 231. Kurz For. Fl. Burm. i. 138, in part. *S. mollis*, Wall. Cat. 1131; R. Brown in Benn. Pl. Jav. Rar. 231. *S. Balanghas*, L. var. *mollis*, Mast. in Hook. fil. Fl. Br. Ind. i. 358.

Burmah; Griffith No. 578 (Kew Dist.); Helfer Nos. 579, 580; Falconer. Perak, King's Collector, No. 8360.

Roxburgh left in the Calcutta Herbarim an excellent coloured drawing of his S. *angustifolia*. In his Flora Indica he gives a very brief account of the species, drawn up from specimens flowering in the Botanic Garden and which he states came from Nepal. His description is too brief to be of any use: but his figure is so good that I have no hesitation in saying that no species of *Sterculia* collected since Roxburgh's time in any part of the outer Himalaya, or from the plain at its base, is in the least like this plant. I have little doubt that Roxburgh was deceived as to its origin by some changing of labels of the native gardeners at Calcutta (a sublimely inaccurate race!); and that the plant was really received, like so many others during the early years of the garden, from the Straits. Wallich, no doubt deceived by the alleged Himalayan origin of the plant, distributed (as No. 1133 of his list) specimens from the trees of it which were still in his time cultivated in the Calcutta Garden under Roxburgh's name, while specimens collected in Burmah he issued as No. 1131, under the name *S. mollis*, Wall. Pierre's figure above quoted does not agree very well with Roxburgh's, the panicles being by far too short and not nearly hairy enough.

12. S. RUBIGINOSA, Vent. Hort. Malmaison, ii. 91. A tree 20 to 50 feet high: young branches rather thick, their apices deciduously rufous-tomentose; the bark pale or brown, striate, glabrous. *Leaves* membranous, obovate-oblong, sometimes ovate-oblong, shortly and abruptly acuminate, entire; narrowed to the acute, rounded or minutely cordate, 3-nerved base: upper surface glabrous, or sparsely stellate-pubescent; the lower stellate-pubescent, most of the hairs pale and minute but these on the midrib and 7 to 10 pairs of spreading stout nerves larger and darker coloured: length 4·5 to 7·5 or rarely 12 in., breadth 2 to 3 in., rarely 4 in.; petiole varying with age from ·3 to 1·5 in., rufous tomentose as are the linear caducous ·5 in. long stipules. *Panicles* solitary in the axils of the crowded young leaves, many-flowered, shorter than, or as long as the leaves, rufous-tomentose like the outer surfaces of the flowers; flower-pedicels spreading, capillary. *Flower buds* broadly ovate. *Calyx* less than ·5 in. long, widely campanulate, divided for half its length or more into 5 lanceolate spreading incurved lobes cohering by their tips, the lobes densely covered inside with white hispidulous hairs. *Male flower;* staminal column longer than the tube or about as

long, glabrous; *anthers* about 10, sessile at the apex of the column, 2-celled, the cells distinct. *Female flower;* gynophore very short; ovaries ovoid, villous (as are the united styles); with 10 sessile anthers at their base; stigma discoid, deeply 5-lobed. *Follicles* 5, coriaceous, crimson when ripe, oblong, shortly beaked, about 2 in. long and 1 in. broad; pubescent externally, glabrous shining and boldly ridged inside. *Seeds* oblong, ovoid, black. Mast. in Hook. fil Fl. Br. Ind. i. 358: Kurz For. Fl. Burm. i. 138; Pierre Fl. Forest. Coch-Chine, t. 194 B; Blume Bijdr. i. 82; Br. in Benn. Pl. Jav. Rar. 231; Miq. Fl. Ind. Bat. i. pt. 2, 175. *S. angustifolia*, Jack Mal. Misc. ex Hook. Bot. Misc. i. 287. *S. Jackiana*, Wall. Cat. 1134.

In all the Provinces except the Andaman and Nicobar Islands: at low elevations. Common. Distrib. Java and Sumatra, Cochin-China, Burmah.

Var. *glabrescens*, King: leaves 8 to 12 in. long, by 3 to 4·5 in. broad, softly pubescent beneath when young, much less narrowed to the (always sub-cordate or cordate) base than in the type; panicles much branched and sometimes longer than the leaves. *S. angustifolia*, Kurz (not Roxb.), in part, For. Fl.. Burm. i. 138; *S. parviflora*, Kurz (not of Roxb.) Journ. As. Soc. Beng. xliii. pt. 2, p. 116. *S. mollis*, Kurz (? of Wall.) l. c. xlv. pt. 2, p. 120. *S. Balanghas*, Linn. var. *glabrescens*, Mast. in Hook. fil. Fl. Br. Ind. i. 358, in part.

Andaman Islands; Helfer (Kew Distrib. No. 595); Kurz, Prain, Bot. Gard. Collectors. Nicobars, Kurz. Great Cocos, Prain. There are no Mergui or Eastern Peninsula specimens of this at Calcutta, and I believe the variety to be confined to the Islands above named.

In this species the petioles lengthen with the age of the leaf, many young leaves having petioles less than ·25 in. long, while in old leaves the length varies from 1 to 1·5 in. And there is considerable variability in the size of the blade. Moreover, while in some the upper surface of the leaves is perfectly glabrous (except the midrib which is almost invariably rusty-tomentose), in others it is rough and scaberulous from the presence of scattered stellate hairs. The next species (*S. ensifolia*, Mast.) has, in my opinion, a very poor claim to specific rank; and I think it would be better to treat it a shrubby variety of this with narrower leaves and longer flowers. *S. parviflora*, Roxb. also differs very little from this, and might be reasonably enough regarded as a form of it with broader more glabrous cordate leaves with fewer nerves.

13. S. ENSIFOLIA, Mast. in Hook. fil. Fl. Br. Ind. i. 359. A shrub or small tree: young branches and petioles densely ferruginous-tomen-

tose. *Leaves* membranous, oblong-lanceolate or oblanceolate, shortly caudate-acuminate, entire, the base rounded, sometimes minutely cordate, rarely acute; upper surface glabrous, the midrib alone tomentose; under surface sparsely rusty-tomentose, the midrib and 8 to 10 pairs of spreading lateral nerves prominent: length 6 to 12 in., breadth 1·25 to 3·5 in., petiole ·3 to 1·5 in.; stipules erect, linear, half as long as the petiole, deciduous. *Panicles* or *racemes* axillary, solitary, lax, few-flowered, rusty-tomentose, hardly so long as the leaves; bracteoles linear, shorter than the pedicels. *Calyx* ·5 or ·6 in. long, broadly campanulate, pubescent on both surfaces, the tube much shorter than the linear-lanceolate spreading lobes the tips of which curve inwards and cohere. *Male flower;* staminal column longer than the calyx-tube but much shorter than its lobes, glabrous, curved, bearing at its apex 10 2-celled, oblong, nearly sessile, anthers. *Female flower;* gynophore very short: ovaries 5, ovoid, rusty-villous, surrounded at the base by 10 sub-sessile stamens. *Styles* short, united, densely covered with white hairs; stigmas united into a boldly 5-lobed disc. *Follicles* 1 to 5, shortly stalked, narrowly oblong, tapering to each end, the apex with a hooked beak, coriaceous, brownish-velvetty, red when ripe, 2 to 2·5 in. long and ·75 in. broad. *Seeds* oval, black, smooth. Pierre Fl. Forest. Coch-Chine t. 194 C. *S. angustifolia*, Jack (not of Roxb.) Mal. Misc. ex Hook. Bot. Mis. i. 287.

Penang, Perak, at low elevations, common. Distrib. Burmah.

I have no doubt whatever that this is the plant described by Jack as the *S. angustifolia* of Roxb.

14. S. PUBESCENS, Mast. in Hook. fil. Fl. Br. Ind. i. 357. A tree, the younger parts rusty-pubescent. *Leaves* oblong, obtuse, or abruptly acuminate, entire, the base cordate; upper surface glabrous; lower densely and minutely pubescent, the nerves stellate-pilose: length 4 to 6 in., breadth 2 to 2·5 in.; petiole 1·25 in., sulcate: stipules subulate, ·25 in. long. *Panicle* erect, as long as or longer than the leaves, much branched: ultimate pedicels jointed, pubescent, spreading. *Calyx* ·25 in. long, campanulate; the lobes triangular acute, as long as the tube, hairy within. *Ovary* globose, downy.

Malacca, Maingay.

Except by Maingay's two specimens in the Kew Herbarium, this species is unknown. Specimens of it in good flower and in fruit are much wanted, so that a completer description than the foregoing may be prepared.

15. S. COLORATA, Roxb. Hort. Beng. 50. A tree 30 to 60 feet

high; young branches thick, rough, rather pale, glabrous. *Leaves* thinly coriaceous, roundish or reniform, usually palmately 3 to 5-lobed, the lobes triangular, acuminate; base deeply cordate, 5 to 7-nerved; both surfaces pulverulent-pubescent when young, glabrous when adult; length 4·5 to 9 in., breadth 5 to 12 in.; petiole 3·5 to 8 in., puberulous; stipules lanceolate, caducous. *Flowers* in axillary panicles or racemes from the axils of last year's fallen leaves, 2·5 to 4 in. long, densely covered, as is the exterior of the flowers, with coral-red, scaly tomentum. *Calyx* ·75 in. long, funnel-shaped, curved, the mouth with 5 acute short triangular teeth, puberulous internally, villous at the base. *Staminal column* as long as, or longer than the calyx, slightly flattened, minutely furfuraceous-pubescent: anthers 20 to 25, sessile at the apex of the column, oblong, closely surrounding the 5 flask-shaped ovaries; styles 5, short, recurved: stigmas acute. *Follicles* 2 to 3 in. long, membranous, glabrous, veined, stipitate, open from an early age and bearing on their edges usually 2 smooth oval seeds. Roxb. Cor. Pl. i. 26, t. 25; Fl. Ind. iii. 146; Mast. in Hook. fil. Fl. Br. Ind. i. 359; Pierre Fl. Forest. Coch-Chine, t. 199; Kurz For. Fl. Burm. i. 138; Brand. For. Flora N. W. Ind. 34; Wall. Cat. 1119; Hook. Ic. Pl. 143; Dalz. & Gibs. Bomb. Fl. 23; W. & A. Prodr. i. 63. *Firmiana colorata.* Br. in Benn. Pl. Jav. Rar. 235; Thwaites Enum. 29. *Erythropsis Roxburghiana*, Scott. & Endl. Melet. Bot. 33.

Andamans; Kurz, Prain. Distrib. India, Ceylon.

16. S. FULGENS, Wall. Cat. 1135. A tree 30 to 70 feet high; young branches rather thick, with smooth dark bark, at first pubescent, ultimately quite glabrous. *Leaves* large and with long petioles, thinly coriaceous, rotund with 5 shallow acuminate lobes, the base cordate: upper surface glabrous, harsh to the touch: lower densely and minutely stellate-pubescent, palmately 7-nerved, the nerves prominent beneath: length and breadth 15 to 18 in.; petiole 15 to 20 in., sulcate, minutely puberulous. *Racemes* or *panicles* 3 to 4 in. long, from the axils of last year's leaves, densely covered with orange or golden-yellowish scurfy tomentum as are the outer surfaces of the flowers. *Calyx* 1·25 in. long, funnel-shaped, slightly curved, the mouth with 5 short triangular teeth; internally minutely velvetty-puberulous with a ring of long matted hair near the base. *Staminal tube* ·5 in., longer than the calyx, 5-angled, sulcate, minutely tomentose; anthers 20, sessile, oblong, 1-celled, embracing the 5 flask-shaped ovaries; styles short, reflexed: stigmas acute. *Follicles* unknown. Mast. in Hook. fil. Fl. Br. Ind. i. 360; Kurz For. Fl. Burm. i. 139: Journ. As. Soc. Beng. pt. 2, 1874, p. 117; Wall. Cat, 1135; *Firmiana colorata* var. *β*, Br. in Benn. Pl. Jav. Rar. 235; Miq. Fl. Ind. Bat., i. pt. 2, 178.

Perak: King's Collector, No. 8673, Scortechini. Distrib. W. Sumatra, Forbes, No. 2105: Java, Burmah; Wallich.

There is no doubt this comes very close to *S. colorata*, Roxb. of which it might possibly be better to treat it as a variety characterised by larger flowers, with much more exserted staminal column, larger leaves, thinner and dark-coloured branchlets. Wallich, however, who saw the tree growing, regarded it as a species; and Robert Brown (Pl. Jav. Rar. p. 235), while treating it as a variety of *colorata*, remarks that it is probably worthy of specific rank. This plant (whether species or variety) is never found in British India proper. Its most northerly limit is Tenasserim, and from thence it extends southward into the Malayan Archipelago. In the Flora of British India, Dr. Masters gives the distribution of this as "Tropical Western Himalayan." The plant, however, which occurs in tropical valleys in that region is just as different from *S. fulgens*, Wall., as that is from *S. colorata*, Roxb. It is the tree to which Wallich gave the name *S. pallens;* and which he published (without describing) in Voigt's Hort. Suburb, Calcutta, p. 105. The leaves of *S. pallens* resemble those of *colorata* in shape; but their under surface is covered with dense pale yellow stellate tomentum. The calyx has a much wider mouth than that of *colorata*, and (like the axis and pedicels of the panicle) is densely covered with a very pale yellow tomentum, while the tomentum of *colorata* is of a vivid coral red. *S. pallens* is confined to the Western Himalaya, just as *S. fulgens* is limited to Burmah and Malaya.

17. S. ALATA, Roxb. Hort. Beng. 50. A tree 80 to 150 feet high; young branches rather stout, striate, glabrous. *Leaves* membranous, broadly ovate or ovate-oblong, acute or shortly acuminate, entire; the base deeply cordate, 5 to 7-nerved, some of the basal nerves pinnate on one side; both surfaces glabrous; lateral nerves 4 pairs, prominent on both surfaces as are the midrib and basal nerves; length 4 to 12 in., breadth 3 to 8 in., petiole 1·5 to 7 in.: stipules minute, subulate, caducous. *Racemes* from the axils of previous year's fallen leaves, usually in pairs, sometimes solitary, rarely terminal, about as long as the petioles, flocculent, rusty-tomentose, as are the flowers externally; bracts 3 to each flower, ensiform, caducous. *Calyx* ·75 in. long, campanulate, deeply divided into 5 or 6 thick, fleshy, lanceolate segments. *Male flower;* staminal column thin, cylindric, much shorter than the calyx, glabrous, bearing at its apex 25 elongate anthers in five groups of 5 each; ovaries imperfect. *Female flower;* staminodes in 5 phalanges, sessile, embracing the bases of the 5 sub-ovate, multi-ovulate-ovaries; stigmas broad, emarginate. *Follicles* pedunculate, woody, pulverulent-

pubescent, 5 in. in diam., sub-globular, slightly compressed. *Seeds* oblong, compressed, the testa spongy, 1 in. long, with a large obovate thick spongy terminal wing 2·5 in. long and 1·25 broad. Roxb. Corom. Pl. iii. 84, t. 287; Fl. Ind. iii. 152; Kurz Fl. Br. Burm. i. 134; Pierre Fl. Forest. Coch-Chine, t. 196; Wall. Cat. 1125. *Pterygota Roxburghii*, Schott & Endl. Melet. *P. alata*, Br. in Benn. Pl. Jav. Rar. 234. *S. coccinea*, Wall. Cat. 1122, partly. *S. Heynii*, Beddome Flor. Sylvat. t. 230.

Perak, Scortechini: Andamans, Kurz. Distrib. Brit. India, Cochin-China.

18. S. LINEARICARPA, Mast. in Hook. fil. Br. Ind. i. 360. A tree 60 to 80 feet high: young branches thick, striate, deciduously pulverulent-tomentose, leaf-cicatrices large. *Leaves* coriaceous, ovate-orbicular, blunt or very slightly narrowed at the apex, edges entire, base deeply cordate, 7-nerved; upper surface glabrous, shining; lower deciduously pulverulent, hairy, almost glabrous when old, minutely reticulate, the midrib and 4 or 5 pairs of lateral nerves prominent: length and breadth 6 to 12 in.; petiole 2·5 to 6 in., sulcate, pulverulent-tomentose. *Panicles* axillary, solitary, stout, erect, as long as or longer than the leaves, rusty pulverulent-tomentose as are the outer surfaces of the calyces, the lateral branchlets short; bracteoles numerous, rotund, concave, caducous; flower-buds globose, sessile. *Calyx* rotate, the tube ·1 in. long, with 5 slightly longer ovate acute lobes, tomentose externally, glabrous within. *Staminal column* not so long as the calyx-tube, glabrous; anthers 10, each with a short filament, cuneate, 2-celled; ovaries (rudimentary in some flowers) about 3, free, each 1 or 2-ovulate; style short; stigma entire, small. *Follicles* (? ripe) linear-lanceolate, 3 to 4 in. long and ·6 in. broad, stipitate, longitudinally ridged and covered outside and inside with yellowish tomentum as is also the single oblong seed.

Malacca, Maingay. Perak; Scortechini, King's Collector.

The flowers and follicles of this are, in my opinion, those of *Scaphium* rather than of *Firmania*, to which section Dr. Masters has referred it.

19. S. SCAPHIGERA, Wall. Cat. 1130. A tree 90 to 120 feet high: young branches rather thick; the bark pale, minutely warted and striate, glabrous. *Leaves* coriaceous, glabrous, ovate to oblong-ovate, sub-acute or bluntish-acuminate, entire; the base rounded or sub-truncate, often faintly cordate or emarginate, 3 to 5-nerved; main nerves 2 to 4 pairs, sub-erect, prominent on both surfaces; length 5 to 10 in., breadth 2·75 to 4·5 in.; petiole 2 to 5 in., thickened at both ends. *Panicles* only at

the ends of the branchlets, puberulous, shorter than the petioles, robust, with many short spreading branches, many-flowered; pedicels short, pubescent; bracteoles subulate, deciduous. *Calyx* from ·3 to ·4 in. long, deeply 5-lobed and almost rotate when expanded, stellate-puberulous externally, glabrous internally, the lobes lanceolate. *Male flower* with 15 to 30 anthers almost sessile round the apex of the column and surrounding the rudimentary villous ovary. *Female flower;* ovaries 5, bi-ovulate; styles united; stigma 5-lobed. *Follicles* 1 to 5, on rather stout pubescent stalks, when ripe 6 to 8 in. long and 1·25 to 2·5 in. broad, membranous, boat-shaped, gibbous about the middle, conspicuously veined and more or less puberulous externally especially on the nerves. *Seeds* 1 (rarely 2), ovoid, glabrous, shining, ·5 to 1 in. long, attached to the very base of the follicle. Mast. in Hook. fil. Fl. Br. Ind. i. 361; Kurz For. Fl. Burm. i. 140; Pierre Fl. Forest. Coch-Chine, t. 201. *Scaphium Wallichii*, R. Br. in Benn. Pl. Jav. Rar. 226.

Malacca, Griffith. Distrib. Sumatra, Burmah.

M. Pierre is in doubt whether his fine figure (l. c. t. 201), represents really the true plant of Wallich. In my opinion it does so most decidedly: R. Brown was right in describing the ovaries as five, and there is a specimen in the Calcutta Herbarium with 5 follicles.

20. S. AFFINIS, Mast. in Hook. fil. Fl. Br. Ind. i. 361. A tree: young branches rather stout, rough, dark in colour, the leaf cicatrices large, the very youngest minutely rusty-tomentose. *Leaves* thinly coriaceous, elliptic-oblong, with rather straight edges; the apex broad, suddenly acute; the base truncate (sometimes obliquely so), 3-nerved; both surfaces glabrous, the upper shining, the lower pale and rather dull: main nerves 6 or 7 pairs, conspicuous beneath as is the midrib; length 5 to 9 in., breadth 4·75 to 5·5 in.; petiole 4·5 in., thickened at each end. "*Panicle* erect, as long as the leaves, its branches downy, flattened or angular; peduncles thickly striated, angular, sub-pilose, spreading; ultimate pedicels downy, densely crowded. *Flowers* very small, the buds ovoid. *Flowers* ·25 in. *Calyx-lobes* ovate, longer than the funnel-shaped tube. *Follicle* a span long, falcate, leafy, glabrescent, shining within. *Seeds* ·65 in. long, solitary, oblong, black." *Scaphium affine*, Pierre Fl. Forest, Coch-Chine, t. 195 E.

Malacca; Maingay, No. 225 (Kew. Distrib.)

The only Maingayan specimen of this in the Calcutta Herbarium consists of leaves only, with a single detached fruit; and I have seen no specimen from any other collector. The foregoing description (as regards inflorescence, flower and fruit) is therefore copied verbatim from Masters (in F. B. I. l. c.).

21. S. CAMPANULATA, Wall. A tree 50 to 60 feet high: young branches rather slender, rusty-tomentose, soon becoming glabrous. *Leaves* membranous, broadly ovate, shortly acuminate, entire; the base usually deeply cordate, 3 to 7-nerved; sometimes 3 to 5-lobed; lateral nerves 3 or 4 pairs; upper surface glabrous, the midrib and nerves pubescent or puberulous; lower surface pubescent; length 4 to 6 in., breadth 3·75 to 5·5 in.; petiole 2·25 to 5 in. puberulous: stipules lateral, subulate, caducous. *Panicles* 3 or 4 in. long, in clusters of 2 or 3 at the apices of the branches, few-flowered, glabrous, erect, sub-corymbose; pedicels jointed, about ·3 in. long, bracteoles caducous. *Calyx* widely campanulate, more than ·75 in. across, green, pruinose, glabrous, veined, its mouth cut half-way down into 5 triangular velvetty-edged lobes: *Staminal column* pubescent below. *Ovaries* gibbous at the apex: styles short, cohering; stigmas filiform, recurved: ovules 2, erect. *Follicles* 3 to 6, on slender puberulous stalks, membranous, veined, 2 to 3 in. long, boat-shaped, saccate with a sub-terminal lanceolate wing. *Seeds* sub-globose, with a shining crustaceous testa, ·5 in. long or less. Mast. in Hook. fil. Fl. Br. Ind. i. 362; Kurz For. Fl. Br. Burm. i. 139. *Pterocymbium Javanicum*, Br. in Benn. Pl. Jav. Rar. 219, t. 45; Miq. Fl. Ind. Bat. i. pt. 2, 179. *Pt. campanulatum* and *Javanicum*, Pierre, Fl. Forest. Coch-Chine, t. 195.

Perak; Fr. Scortechini, King's Collector. Nicobars, Kurz. Distrib. Malayan Archipelago, Burmah.

M. Pierre (l. c.) remarks that, in his opinion, the two species *campanulatum* and *Javanicum*, although closely related, are distinct species; but he does not mention the characters on which he relies for separating them. After dissecting many flowers of the tree (until recently growing in the Botanic Garden, Calcutta), on which Wallich founded his species *campanulatum*, I cannot see any respect in which they differ from Robert Brown's minute and excellent description and figures of *Pt. Javanicum*. I therefore agree with Dr. Masters in considering the two as one and the same species.

22. S. TUBULATA, Mast. in Hook. fil. Fl. Br. Ind. i. 362. A tree; young branches about as thick as a goose-quill, tomentose at the very points, the bark dark and rather rough. *Leaves* thinly coriaceous, elliptic-oblong, with a short abrupt rather blunt apiculus; edges entire; the base broadly rounded or sub-truncate, very slightly cordate; when adult both surfaces glabrous except the midrib and main nerves which are minutely rusty-tomentose; main nerves 5 to 7 pairs, spreading, slightly prominent below: length 4 in., breadth 1·75 in.; petiole ·75 in. slender, deciduously rusty-tomentose. *Cymes* terminal, as long as the

leaves, many-flowered. *Calyx* ·5 in. long, glabrous, narrowly tubular below, the mouth slightly expanded and with 5 ovate-lanceolate lobes shorter than the tube. *Staminal column* pilose; anthers in a ring. *Ovaries* 5; styles inflexed, cohering by their tips. *Follicles* 5, from 2 to 3 in. long and 1 in. broad, on tomentose stalks, oblong, acute, dilated at the base. *Seed* ovoid.

Malacca, Maingay.

At once distinguished by the singular calyx, tubular in its lower, lobed and spreading in its upper, half.

2. TARRIETIA, Blume.

Tall trees. *Leaves* digitate or simple, glabrous or scaly. *Flowers* unisexual, panicled. *Calyx* tubular, small, 5-toothed. *Petals* 0. *Staminal-column* short, bearing a ring of 10-15 very densely clustered anthers, cells parallel. *Ovary* of 3-5 nearly free carpels opposite the sepals; styles as many, short, filiform, stigmatose within; ovules 1 in each cell. *Ripe carpels* of stellately spreading samaras with long falcate wings. *Seeds* oblong; albumen bipartible; cotyledons flat; radicle next the hilum.—Distrib. Known species 5 or 6, Australian and Malayan.

Leaves digitately compound.
  Under-surface of leaflets persistently stellate-tomentose ... ... 1. *T. Perakensis.*
  Under-surface deciduously tomentose, the hairs simple ... ... 2. *T. Penangiana.*
Leaves simple.
  Fruit glabrous ... ... 3. *T. simplicifolia.*
  ,, tomentose. ... ... 4. *T. Kunstleri.*

1. T. PERAKENSIS, King, n. sp. A tree 40 to 60 feet high: young branches, petioles, petiolules, under surface of leaves (when young) and inflorescence with minute deciduous rusty tomentum. *Leaves* digitately compound; leaflets 5 or 6, the lower smaller, obovate-elliptic to obovate-rotund, shortly and rather abruptly acuminate, the edges entire, slightly wavy; the base narrowed; upper surface minutely areolate, glabrous except the very minutely tomentose midrib and nerves; lower glabrous except the midrib: main nerves 10 to 14 pairs, stout and prominent beneath: length of the middle leaflet 4·5 to 5·5 in., of the lower 2 to 3·5 in.: breadth of the middle 2 to 3 in., of the lower 1·25 to 1·5 in.; petiolules ·5 to 1 in.; petioles ·3 to 4·5 in. *Inflorescence* in solitary, axillary, cymose racemes or panicles more than half as long as the

leaves, much crowded at the points of the branches. *Flowers* ·15 in. long: pedicels slender, three times as long. *Calyx-tube* tomentose externally, sparsely pubescent within; *staminal tube* less than half its length. *Female calyx* rather longer than the male, otherwise the same: stamens 0: ovaries 5, obliquely ovoid, glabrous, each with a pubescent conic style crowned by a small hooked stigma. *Ripe fruit* compressed-ovoid, 1·25 to 1·5 in. long, and 1 to 1·15 in. in diam., glabrous, the wing falcate, 2 in. long and ·5 in. broad, striate.

Perak, at low elevations; King's Collector, Penang, Curtis, No. 2229.

In its leaves this much resembles *T. Javanica*, Bl. (Rumphia iii. t. 127, fig. 1); but the leaves of Blume's plant are smaller and have more wavy edges. The flowers, however, of the two differ much in size, those of this being twice as large as the flowers of *T. Javanica*.

2. T. CURTISII, King, n. sp. A tree 20 to 40 feet high; young branches, petioles, petiolules and under surfaces of leaves densely covered with rusty stellate, non-deciduous tomentum. *Leaves* digitately 5 or 6-foliolate, the lower smaller, obovate, entire, wavy, apex retuse, base acute; upper surface minutely areolate, glabrous except the stellate-tomentose midrib and main nerves; under surface, and especially the midrib, stellate-tomentose: main nerves 9 or 10 pairs, spreading, prominent beneath: length of the middle leaflet 3·5 to 4·5 in., of the lower 1·5 to 2·5 in.; breadth of the middle 2·25 to 2·5 in., of the lower ·8 to 1·5 in., petiolules ·5 to ·75 in., petioles 2 to 2·5 in. *Inflorescence* in solitary, axillary, cymose racemes or few-flowered panicles, more than half as long as the leaves. *Ripe fruit* glabrous, compressed-ovoid, 1 in. long and ·8 in. broad; wing narrowly falcate, 1·25 in. long and ·25 in broad, striate.

Penang at 2000 feet: Curtis No. 1427.

This is known only by Curtis's scanty specimens which are in fruit only. Its flowers are unknown. In leaves it closely approaches *T. Perakensis*, but the tomentum is stellate and persistent; whereas in *T. Perakensis*, the hairs are simple and deciduous. The leaflets of this are also smaller, fewer-nerved, more decidedly obovate, less elliptic than in *T. Perakensis*, and they are mucronate rather than acuminate.

3. T. SIMPLICIFOLIA, Mast. in Hook. fil. Fl. Br. Ind. i. 362. A tree, young branches pale, sub-glabrous, striate. *Leaves* simple, coriaceous, elliptic or obovate-elliptic, apex truncate or emarginate, shortly mucronate, entire, rather suddenly narrowed at the base or rounded; upper surface glabrous, shining; lower dull, rusty, minutely puberulous,

and slightly scaly; main nerves 16 to 20 pairs, prominent below, spreading; length 4·5 to 7 in., breadth 3 to 4·5 in.; petiole 2 to 3 in., thickened towards the apex. *Cymes* axillary, solitary, many-flowered, 1·5 to 2·5 in. long, minutely rusty-tomentose. *Flowers* ·1 in. long; the pedicels shorter, stout. *Calyx-tube* campanulate, minutely tomentose externally, puberulous within: staminal tube short. *Fruit* (including wing) 3 in. long, obliquely spathulate, glabrous.

Malacca; Griffith, Maingay (Kew Distrib.) No. 231.

4. T. KUNSTLERI, King, n. sp. A tree 50 to 70 feet high: young branches petioles and peduncles minutely stellate-pubescent and lenticellate. *Leaves* elliptic to obovate-oblong, blunt, mucronate, entire, the base rounded or slightly narrowed: upper surface smooth, shining; the lower pale, sparsely stellate-puberulous on the midrib and nerves, otherwise (under a lens) minutely puberulous: main nerves 7 to 10 pairs, ascending, prominent beneath. *Fruit* at the apex of a solitary stellate-hairy peduncle, ovoid with an oblique sub-spathulate wing, minutely but densely velvetty fulvous-tomentose; length of body 1 in. or more; wing about the same length and ·6 in. broad.

Perak, near Laroot; King's Collector No. 7581.

Flowers of this are at present unknown. The leaves are at once distinguished from those of *T. simplicifolia* by their pale under surface, and the fruits by their tomentum.

3. HERITIERA, Aiton.

Trees. *Leaves* coriaceous, simple, scaly beneath. *Flowers* small, unisexual, in axillary panicles. *Calyx* 5, rarely 4-6 toothed or cleft. *Petals* 0. *Anthers* in a ring at the top of the column, cells 2, parallel. *Ovaries* 5-6, almost free: style short, stigmas 5, thick; ovules solitary in each cell. *Ripe carpels* woody, indehiscent, keeled or winged. *Albumen* 0; cotyledons thick; radicle next the hilum.—A genus of 6 or 7 species, natives of the Tropics of the old world, and of Australia.

H. LITTORALIS, Dryand. in DC. Prod. i. 484. A tree: young branches stout, rough. *Leaves* oblong or elliptic, the apex rounded or acute; the edges entire; base rounded or slightly cordate; lower surface pale; main nerves 7 to 9 pairs, slightly prominent beneath: length 5 to 10 in., breadth 2·25 to 4 in., petiole ·5 to ·75 in.: stipules lanceolate, caducous. *Flowers* ·2 in. long, in many-flowered axillary cymose panicles shorter than the leaves. *Calyx* 5-toothed, puberulous, half as long as the pedicel. *Ripe fruit* 1·5 to 3·5 in. long, woody, compressed ovoid, boldly keeled at apex and on dorsum, glabrous, shining. Mast. in Hook. fil. Fl.

Br. Ind. i. 363; Kurz For. Fl. Burm. i. 140; Pierre Fl. Forest. Coch-Chine, t. 203; Miq. Fl. Ind. Bat. i. pt. 2, p. 179; Blume Bijdr. 84; Roxb. Fl. Ind. iii. 142; W. & A. Prodr. i. 63: Thwaites Enum. 28; Br. in Benn. Pl. Jav. Rar. 237; Miq. Fl. Ind. Bat. i. pt. 2, p. 179. *H. Fomes*, Wall. Cat. 1139, partly. *Balanopteris Tothila*, Gærtn. Fruct. ii. 94, t. 99.

All the Provinces, on the coasts. Distrib. Malayan Archipelago and coasts of the tropics of the old world generally, and of Australia.

The plant originally issued by Wallich as *Trochetia contracta* (Cat. No. 1162) and afterwards named by him *Heritiera macrophylla*, (Pierre l. c. t. 204) has by some writers been reduced to *H. littoralis*. But Wallich's species was originally found in the interior of Burmah, and it has since been found in Cachar, far from the sea coast to which *H. littoralis* is strictly confined. *H. macrophylla* has moreover leaf-petioles more than twice as long as those of *H. littoralis*, and its fruit is warted and not smooth. I believe *H. macrophylla* to be a perfectly distinct species; as is also, in my opinion, the other Sylhet and Khasia small-leaved plant which Wallich issued as *H. acuminata*. (Cat. No. 7836.)

4. KLEINHOVIA, Linn.

A tree. *Leaves* 5 to 7-nerved and often cordate at the base. *Inflorescence* a terminal, lax, cymose panicle. *Bracteoles* small. *Sepals* 5, much longer than the petals, linear-lanceolate, deciduous. *Petals* 5, unequal, the upper short, ovate-round, saccate, the middle pair concave and obliquely oblanceolate, the lower pair flat with convolute edges. *Stamens* 20, in 5 phalanges of 3 each with five solitary, free, often non-antheriferous, filaments between the phalanges; the filaments of all conjoined below into a long, externally hairy, narrowly cylindric tube which surrounds the gynophore: anthers 4-celled, divergent. *Ovary* at the apex of the long gynophore and surrounded by the staminal tube, 5-lobed, 5-celled. *Capsule* turbinate-pyriform, membranous, inflated, 5-celled, loculicidal. *Seeds* 1 or 2 in each cell, tubercled: cotyledons convolute, radicle inferior. Distrib. One species. Tropics of the old world.

K. HOSPITA, L. Spec. 1365. *Leaves* ovate-rotund, acuminate, entire, palmately 3-5-nerved at the base, glabrous: length 3 to 6 in., breadth 2·5 to 5 in., petiole 1·5 to 2·5 in. DC. Prodr. i. 488; W. & A. Prodr. i. 64; Roxb. Fl. Ind. iii. 141; Miq. Fl. Ind. Bat. i. pt. 2, 186; Blume Bijdr. 86; Hassk. Pl. Jav. Rar. 313; Mast. in Hook. fil. Fl. Br. Ind. i. 364. Pierre Fl. Forest. Coch-Chine, t. 177.

In all the Provinces, but usually planted. Distrib. Malaya, Australasia, Br. India.

Apparently a variable plant. Dr. Masters (in Oliver's Flora of Trop. Africa, i. 226), describes the African specimens as having no stamens or staminodes alternating with the 5 phalanges of stamens. A specimen in the Calcutta Herbarium from Java has the under surface of the leaves softly hairy.

5. HELICTERES, Linn.

Trees or shrubs, more or less stellate-pubescent. *Leaves* simple. *Flowers* axillary, solitary or fascicled. *Calyx* tubular, 5-fid, often irregular. *Petals* 5, clawed, equal or unequal, the claws often with ear-shaped appendages. *Staminal column* surrounding the gynophore, 5-toothed or lobed at the apex; anthers at the top of the column, 2-celled. Five staminodes below the apex of the column. *Ovary* at the top of the column, 5-lobed, 5-celled; styles awl-shaped, more or less united, slightly thickened and stigmatose at the tips; ovules many in each cell. *Follicles* spirally twisted, or straight. *Seeds* tubercled; albumen scanty; cotyledons leafy, folded round the radicle which is next the hilum.—Distrib. About 30 species, natives of the tropics of both hemispheres.

Fruit spirally twisted ... ... 1. *H. Isora.*
Fruit not twisted.
  Leaves ovate to oblong-lanceolate, oblique; fruit more than 1 in. long ... 2. *H. hirsuta.*
  Leaves lanceolate or oblanceolate, not oblique: fruit less than 1 in. long ... 3. *H. angustifolia.*

1. H. ISORA, Linn. Spec. 1366. A shrub or small tree; young branches minutely tomentose. *Leaves* ovate-rotund, oblique; the apex rounded, abruptly acuminate; the edges irregularly serrate-dentate, sometimes lobed; the base cordate or rounded, rarely acute, palmately 5- to 7-nerved; upper surface scabrous, minutely hispid; lower pubescent or tomentose; length 2 to 4 in., breadth 1·25 to 3 in.; petiole ·3 in. long, tomentose; stipules linear, about as long as the petioles. *Flowers* axillary, solitary, or in few-flowered minutely bracteolate cymes, 1·5 in. long. *Calyx* narrowly campanulate, laterally compressed, 2-lipped, 5-toothed, tomentose outside. *Petals* reflexed, the lower two much shorter and broader than the three upper. *Staminal column* longer than the petals, curved, very narrowly cylindric, bearing at its apex 10 to 12 elongate-ovate stamens, and more internally 5 flat bifid staminodes. *Ovary* ovoid, sulcate, tomentose: styles slender, glabrous, united. *Fruit* cylindric, twisted, crowned by the persistent styles, pubescent; 1·5 in. long, ·4 in. in diam. Mast. in Hook. fil. Fl. Ind. i. 365; Bl.

Bijdr. 79; Pierre Fl. Forest. Coch-Chine, t. 208, figs. 12 to 25; DC. Prodr. i. 475; Roxb. Fl. Ind. iii. 143; W. & A. Prodr. i. 60; Wight Ic. t. 180; Miq. Fl. Ind. Bat. i. pt. 2, 169; Kurz For. Fl. Burm. i. 142; Brand. For. Flor. 34. *H. chrysocalyx*, Miq. in Pl. Hohen. *Isora corylifolia*, Wight, Hassk. in Tijds. Nat. Gesch. xii. 107.

Perak; and probably in all the provinces. Distrib. Brit. India.

2. H. HIRSUTA, Lour. Fl. Coch-Chine, 648. A shrub 6 or 8 feet high; the young branches velvetty-tomentose. *Leaves* ovate, or ovate-rhomboid, sub-oblique (oblong to oblong-lanceolate in vars.) acuminate, irregularly erose-serrate; the base sub-truncate or rounded, rarely sub-emarginate; upper surface scabrid-pubescent, the midrib and nerves tomentose; lower velvetty-tomentose; nerves 4 or 5 pairs, prominent beneath; length 3·5 to 6 in., breadth 1·75 to 2·5 in.; petiole ·4 in., tomentose. *Cymes* scorpioid, few-flowered, axillary, solitary, twice as long as the petiole. *Flowers* ·75 in. long. *Calyx* narrowly cylindric-campanulate, coarsely stellate-tomentose externally, the mouth with 5 acute unequal teeth. *Petals* linear, sub-spathulate, two rather broader than the others with slight horn-like appendages about the middle and all longer than the calyx and about as long as the stamens. *Staminal column* and pistils as in *H. Isora. Fruit* cylindric, acuminate, not twisted, the carpels firmly coherent; externally densely covered by long villous and stellately pilose soft prickles, 1·2 in. long and ·35 in. in diam. Pierre Fl. Forest. Coch-Chine, t. 208, figs. 1 to 11; Kurz For. Fl. Burm. i. 143. *H. hirsuta*, Bl. Bijdr. 80. *H. spicata*, Colebr. in Wall. Cat. 1182; Mast. in Hook. fil. Fl. Br. Ind. i. 366; *Oudemansia hirsuta*, Miq. Fl. Ind. Bat. i. pt. 2, p. 171; Hassk. Retzia, i. p. 184; *Orthothecium hirsutum*, Hassk. Pl. Jav. Rar. 308.

Selangore, King's Collector. Penang, Curtis; and probably in the other provinces at low elevations. Distrib. Malayan Archipelago, China, Brit. India.

Var. *oblonga*, (species Wall. Cat. 1183). *Leaves* oblong, 5 or 6 in. long and 1·35 to 1·75 in. broad, sparsely stellate-tomentose beneath.

Penang, Andamans.

Var. *vestita*, (species Wall. Cat. 1844). *Leaves* oblong-lanceolate, oblique at the base; 3·5 to 5·5 in. long and 1 to 1·5 in. broad.

Burmah: ? Andamans.

There seems to be little doubt that Loureiro and Blume independently of each other gave this species the same specific name. Wallich's distribution of it under Colebroke's MSS. name *spicata* took place many years subsequently, and that name must (although adopted by Dr. Masters) I think fall to the ground.

3. H. ANGUSTIFOLIA, L. sp. 1366. A shrub 4 to 6 feet high: young branches, petioles, under surfaces of leaves and peduncles minutely and more or less densely pubescent. *Leaves* lanceolate or oblanceolate, acute (or obtuse and mucronate in var. obtusa); entire; the base narrowed 3-nerved; upper surface glabrescent or glabrous; lateral nerves 5 or 6 pairs, not prominent; length 1·5 to 2 in., breadth ·4 to ·8 in., petiole ·2 to ·3 in. *Cymes* axillary, solitary, not much longer than the petioles, few-flowered. *Flowers* ·4 or ·5 in. long. *Calyx* densely stellate-tomentose externally, cylindric, the mouth slightly expanded, with 5 acute triangular teeth, 2-lipped. *Petals* longer than the calyx, linear-subspathulate, with 2 or 3 horned appendages below the middle. *Staminal column* shorter than the petals, narrowly cylindric and otherwise as in *H. Isora*, the stamens smaller. *Ovary* inserted near the apex of the staminal tube, sub-globular, ridged, tomentose. *Fruit* ovoid-cylindric, apiculate, not twisted, the carpels closely coherent, ·75 in. long and ·4 in. in diam., densely covered with stellate, villous soft prickles as in *H. hirsuta*. DC. Prodr. i. 476; Mast. in Hook. fil. Fl. Br. Ind. i. 365; Bl. Bijdr. 80; Pierre Fl. Forest. Coch-Chine, t. 210 and 211; Wall. Cat. 1180. *H. lanceolata*, DC. Prodr. i. 476; Pierre, l. c. 210 B. *H. virgata*, Wall. Cat. 1181. *Oudemansia integerrima*, Miq. Pl. Jungh. i. 296; Fl. Ind. Bat. i. pt. 2, 170. *Oud. Javensis*, Hassk. Retzia, i. 134. *Orthothecium Javense*, Hassk. Pl. Jav. Rar. 307.

Malayan Archipelago, China.

Var. *obtusa*, (species Wall. Cat. 1184); Pierre, l. c. 211 B, 14 to 25. Kurz in Journ. As. Soc. Beng. 1873, pt. ii. 62. *Leaves* obtuse, mucronate.

Perak; Nicobar Islands.

6. PTEROSPERMUM, Schreb.

Trees or shrubs, scaly or stellate-tomentose. *Leaves* usually bifarious, leathery, oblique, simple or lobed, penninerved. *Peduncles* 1-3, axillary and terminal. *Bracteoles* entire, laciniate, persistent or caducous. *Calyx* of 5 valvate, coriaceous, more or less connate, sepals. *Petals* 5, imbricate, membranous, deciduous with the calyx. *Staminal column* short, bearing opposite to the sepals 3 linear 2-celled anthers, and opposite to the petals 5 ligulate staminodes; cells parallel; connective apiculate. *Ovary* inserted within the top of the staminal column, 3-5 celled; style entire, stigma 5-furrowed; ovules many in each cell. *Capsule* woody or coriaceous, terete or angled, loculicidally 5-valved. *Seeds* winged above, attached in two rows to the inner angle of the cells of the capsule; albumen thin or 0; cotyledons plaited or corrugated, radicle inferior. Distrib. A genus of about 18 species, confined to tropical Asia.

Flowers 6 in. long ... ... 1. *P. diversifolium.*
,, 2 in. long.
Sepals shortly pubescent inside, capsule 3 to 4 in. long. 2. *P. Blumeanum.*
Sepals with silky hairs inside; capsule 1·5 in. long, with scaly hairs ... ... 3. *P. Jackianum.*
,, less than 2 in. long; capsule 2 to 2·5 in., glabrous ... ... 4. *P. aceroides.*

1. P. DIVERSIFOLIUM, Blume, Bijdr. 88. A tree 60 to 100 feet high: young branches, petioles, under surfaces of leaves and outer surface of sepals and fruit covered with a layer of minute, tawny tomentum with many, more or less deciduous, rufous, stellate hairs on its surface. *Leaves* coriaceous, varying from obovate-oblong to elliptic-rotund; the apex broad, blunt, or sub-truncate, suddenly contracted into a triangular point; the edges entire or sinuous, rarely lobed; the base always cordate or emarginate, 3 to 7-nerved and often oblique: upper surface shining, glabrous, except the tomentose midrib: main nerves 8 to 10 pairs, straight, sub-erect, prominent on both surfaces; length 6 to 9 in., breadth 3·5 to 6 in., petiole 1 to 1·25 or even 2 in., stipules small linear, caducous. *Flowers* 6 to 7 in. long, buds narrowly cylindric, solitary, or in 3 to 4-flowered sub-sessile axillary cymes; pedicels ·2 in. long, each with a minute recurved lanceolate bracteole. *Sepals* coriaceous, slightly shorter than the petals, linear, blunt, adpressed-sericeous internally. *Petals* membranous, linear, glabrescent. *Staminal tube* and gynophore 2 in. long; the free part of the filaments slightly longer; fertile anthers about 10, linear; staminodes 5, pubescent. *Ovary* fusiform, tomentose, 5-celled. *Style* less than 2 in. long, angled, pubescent; stigma fusiform. *Capsule* woody, oblong, pointed, acutely 5-angled, suddenly constricted at the base, about 4 to 5 in. long and 1·5 to 2 in. in diam. *Seeds* flattened, 1·5 to 2 in. long. Mast. in Hook. fil. Fl. Br. Ind. i. 367; Pierre Fl. For. Coch-Chine, t. 179; Miq. Fl. Ind. Bat. i. pt. 2, p. 192; Hassk. Pl. Jav. Rar. 316; Korth. Ned. Kruik. Arch. i. 312. *P. acerifolium*, Zoll. et Mor. Syst. Verz. p. 27 (excl. syn. Willd.)

Perak, Malacca; common; at low elevations. Distrib. Java, Philippines, Cochin-China.

The leaves on young shoots of this are often peltate and deeply lobed.

2. P. BLUMEANUM, Korth. Ned. Kruik. Arch. ii. p. 311. A tree

40 to 50 feet high: young branches slender, almost black when dry; when very young covered by deciduous furfuraceous rufous stellate hairs. *Leaves* thinly coriaceous, very inequilateral, oblong to ovate or lanceolate-oblong, entire, acuminate; the base broad, unequally cordate, one side auriculate or sub-auriculate; upper surface very dark when dry, glabrous, shining; the lower densely but minutely tawny or rufous-tomentose with many deciduous cinnamoneous stellate hairs on the surface; main nerves 5 to 7 pairs, prominent beneath; length 3 to 5·5 in., breadth 1·35 to 2 in.; petiole ·15 in.; stipules subulate-lanceolate. *Flowers* 2 in. long, solitary, or in 2-3-flowered cymes, axillary, or (by the suppression of the leaves) in terminal racemes: pedicels ·5 in. long, bracteate, cylindric in bud. *Sepals* coriaceous, narrowly linear, acute, scurfy, stellate-pubescent externally as are the pedicels and bracteoles, pubescent internally. *Petals* membranous, obliquely oblong-oblanceolate or sub-spathulate, shorter than the sepals, glabrescent. *Staminal tube* and gynophore about ·5 in. long, the free part of the filaments rather longer; fertile anthers about 10; staminodes 5, scaly-pubescent above. *Ovary* ovoid, villous, 5-celled. *Style* shorter than the staminal tube, glabrous: stigma narrowly ovoid. *Capsule* woody, oblong, 5-angled, sub-acute, gradually and slightly narrowed at the base, glabrous when ripe; 3 to 4 in. long and 1·5 in. in diam. *Seeds* flat, 1·5 in. long. Miq. Fl. Ind. Bat. i. pt. 2, p. 191. *Pterospermum lanceaefolium*, Bl. (not of Roxb.) Bijdr. 87. *P. cinnamoneum*, Kurz, For. Fl. Burm i. 147. *P. Javanicum*, Jungh. Kurz, l. c. i. 147.

Perak, Penang; common at low elevations. Distrib. Sumatra, Java, Borneo, Burmah, Assam.

A very common tree in Perak. Korthal's Bornean species *P. fuscum* appears to me to be nothing more than a very cinnamoneous-tomentose form of this. And the Peninsular-Indian *P. rubiginosum*, Heyne, (Mast. in Hook. fil. Fl. Br. Ind. i. 368) cannot be very different. I should be induced to reduce both to the oldest described species which is this. Of the absolute identity of Kurz's *P. cinnamoneum* with this I have no doubt whatever.

3. P. JACKIANUM, Wall. Cat. 1164. A tree: the small branches slender, rather dark, when young covered by a layer of white minute tomentum with many rufous stellate hairs on its surface. *Leaves* sub-coriaceous oblong or elliptic-oblong, slightly inequilateral, entire, or sinuate towards the rather abruptly acuminate apex; the base sub-acute, or truncate and minutely cordate or emarginate, never auricled; upper surface pale brown when dry, glabrous except the puberulous midrib and nerves; under surface pale brown or buff, with

a layer of minute tomentum and on the surface (and especially on the midrib and nerves) many minute deciduous rusty stellate hairs; nerves 10 to 12 pairs, prominent beneath, spreading; length 4 to 5·5 in., breadth 1·5 to 2 in., petiole ·25 in.; stipules caducous. *Flowers* 2 in. long: the buds cylindric, acute, solitary, axillary; pedicels ·1 in. long, tomentose like the exterior of the sepals, minute, linear-subulate. *Sepals* linear-lanceolate, adpressed-sericeous within. *Petals* shorter than the sepals, oblanceolate, scaly, puberulous externally. *Staminal tube* and gynophore ·25 in. long, the free part of the filaments more than twice as long; fertile anthers about 12; staminodes 5. *Ovary* fusiform. *Style* longer than the stamens, pubescent below; stigma cylindric. *Capsule* (*fide* Masters) shortly stalked, ovoid, terete, acute, 1·5 in. long and 1 in. in diam., covered with flat scaly hairs. Mast. in Hook. fil. Fl. Br. Ind i. 367; *P. oblongum*, Wall. Cat. 1165.

Penang; Jack, Wallich, Curtis. Malacca; Stolickza, at low elevations.

This species does not appear to be a common one. *P. Blumeanum* has probably been mistaken for it.

4. P. ACEROIDES, Wall. Cat. 1171. A tree 35 to 50 feet high: young branches rather slender, covered (as are the petioles and under surfaces of the leaves) by a thin felted layer of minute white tomentum, above which is a superficial deciduous layer of loose stellate rufous hairs. *Leaves* coriaceous, more or less elliptic, sometimes obovate-elliptic, the apex abruptly and shortly acuminate, the edge often straight at the sides, sometimes waved, never lobed: the base sub-truncate, often cordate, 5 to 7-nerved; upper surface (when adult) glabrous: main lateral nerves 12 to 15 pairs, straight, oblique; length 5 to 10 in., breadth 3·25 to 5·5 in., petiole ·4 to ·5 in. *Flowers* 1·5 to 1·75 in. long; solitary, or in 3 to 4-flowered sub-sessile axillary cymes; pedicels ·2 in. long, each with a deeply lobed tomentose bract; the buds narrowly cylindric, ribbed. *Sepals* very coriaceous, recurved, longer than the petals, linear, acute, scurfy-tomentose outside, adpressed-pubescent within. *Petals* membranous, obovate, glabrous in the inner, scurfy on the outer, surface. *Stamens* as long as the petals or shorter, the tube only ·25 in. long: fertile anthers about 15, linear. *Style* shorter than the stamens, glabrous; stigma clavate; ovary densely sericeous, 5-angled. *Capsule* woody, oblong, pointed at both ends, angled, glabrous, 2 to 2·5 in. long. Kurz in Journ. As. Soc. Beng. 1873, pt. 62; For. Flora Burm. i. 145. *P. acerifolium*, Mast. (not of Willd.) in Hook. fil. Fl. Br. Ind. i. 368, in part. Miq. Ill. Arch. Ind. 84, in part.

Andaman Islands; Helfer, No. 568 (Kew Distrib.), Kurz, King's Collectors. Distrib. Burmah; Wallich.

The nearest ally of this is no doubt *P. acerifolium*, Willd., to which it has been reduced by Dr. Masters. But (having had living trees of both under observation in the Botanic Garden, Calcutta, for many years) I have no hesitation in saying that the two species are quite distinct. *P. aceroides* has entire, not lobed, leaves; much smaller flowers (less than 2 in. long) which expand during December and January: while those of *P. acerifolium* measure ·6 in. length and open in March or April. The capsule of *P. aceroides* is moreover only 2 to 2·5 in. long and quite glabrous; while that of *P. acerifolium* is 4 to 6 in. long, with a rough densely stellate tomentose exterior.

7. MELOCHIA, Linn.

Herbs or undershrubs, more or less downy. *Leaves* simple. *Flowers* small, clustered or loosely panicled. *Sepals* 5, connate below. *Petals* 5, spathulate, marcescent. *Stamens* 5, opposite to the petals, connate below into a tube; anthers extrorse, 2-lobed, lobes parallel. *Ovary* sessile, 5-celled; cells opposite the petals, 2-ovuled; styles 5, free or connate at the base. *Capsule* loculicidally 5-valved. *Seeds* ascending, albuminous; embryo straight, cotyledons flat, radicle next the hilum.—Distrib. Species about 50, natives of the warmer regions of both hemispheres.

1. M. CORCHORIFOLIA, Linn. sp. 944. A pubescent, branching herb or undershrub. *Leaves* membranous, variable, broadly ovate, to ovate-oblong or lanceolate, acute, serrate or obscurely lobed; the base rounded, truncate or sub-hastate, 5-nerved, often plaited; petiole from ·4 to 1 in.; stipules linear, minute. *Flowers* ·2 in. in diam., in crowded terminal or axillary heads with many villous bracteoles intermixed. *Sepals* lanceolate, acuminate, ascending. *Petals* obovate. *Ovary* villous; styles glabrous. *Capsule* pisiform, pubescent, exceeding the calyx. Willd. Sp. Pl. iii. 604; Roxb. Fl. Ind. iii. 139; Wall. Cat. 1196, in part; Mast. in Hook. Fl. Br. Ind. i. 374. *M. truncata*, Willd. Sp. Pl. iii. 601. *M. supina*, L. Sp. Pl. 944. *M. affinis*, Wall. Cat. 1198. *M. pauciflora*, Wall. Cat. 1199. *Riedleia corchorifolia*, DC. Prodr. i. 491; W. & A. Prodr. i. 66; Miq. Fl. Ind. Bat. i. pt. 2, 188. *R. truncata*, W. & A. l. c. 66. *R. supina*, DC. Prodr. i. 491. *R. concatenata*, DC. Prodr. i. 492. *Visenia corchorifolia*, Spreng. Syst. iii. 30. *V. concatenana*, Spreng. Syst. iii. 30. *V. supina*, Spreng. Syst. iii. 31. *Melochia concatenata*, Wall. Cat. 1197. *Sida cuneifolia*, Roxb. Hort. Beng. 50.

In all the provinces, a common weed. Distrib. The Tropics generally.

2. M. VELUTINA, Bedd. Fl. Sylvat. t. 5. A large shrub or small tree, all parts pubescent and with many of the hairs stellate. *Leaves* membranous, long-petioled, broadly ovate, acuminate, coarsely and irregularly serrate; the base 5 to 7-nerved, rounded or cordate; 4 to 9 in. long, by 3·5 to 8 in. broad: petioles 2·5 to 4·5 in.; stipules rounded, ·25 in. long. *Cymes* on peduncles longer than the petioles, much branched, spreading, many-flowered, terminal and axillary. *Flowers* ·25 in. in diam., pink. *Calyx* campanulate, with 5 deep broad abruptly acuminate teeth. *Petals* narrowly oblong, longer than the calyx, membranous. *Stamens* inserted on a hypogynous disk as are the petals; filaments flat. *Ovary* villous, as are the lower parts of the styles. *Capsules* ·3 to ·5 in. long, ovoid-cylindric, apiculate, deeply 5-grooved, bristly-tomentose. *Seed* solitary in each cell, its wing ascending. Mast. in Hook. fil. Fl. Br. Ind. i. 374; Kurz For. Fl. Burm. i. 148. *Visenia indica*, Houtt. Linn. Syst. vi. p. 287, t. 46; Miq. Fl. Ind. Bat. i. pt. 2, p. 189. *V. umbellata*, (Houtt.) Bl. Bijdr. 88; Wight Ic. 509. *V. Javanica*, Jungh. in Tijdsc. Nat. Gesch. viii. 302. *Glossospermum velutinum*, Wall. Cat. 1153. *G. ? cordatum*, Wall. Cat. 1155.

In all the Provinces at low elevations—a tree-weed appearing in abandoned fields. Distrib. Malayan Archipelago, British India, Mauritius.

8. WALTHERIA, Linn.

Herbs or undershrubs. *Leaves* simple. *Stipules* linear. *Flowers* small, in dense axillary or terminal clusters. *Sepals* 5, connate below into a bell-shaped tube. *Petals* 5, oblong-spathulate. *Stamens* 5, tubular below; anthers 2-lobed, lobes parallel. *Staminodes* 0. *Ovary* sessile, 1-celled; 2-ovulate. *Styles* 2, distinct, clavate. *Capsule* 2-valved, 1-seeded. *Seeds* ascending, albuminous; embryo straight, cotyledons flat. Distrib. About 15 species, one or two of which are weeds in the Tropics generally; the others are Tropical S. American.

W. INDICA, Linn. sp. 941. A pubescent undershrub. *Leaves* ovate-oblong, obtuse, serrate or crenate, the base rounded or cordate; nerves 5 to 7 pairs, prominent beneath. *Flowers* ·25 in. in diam., sessile; bracts linear. *Calyx* campanulate, villous, 10-nerved, the mouth with 5 acuminate teeth. *Petals* oblanceolate, clawed, longer than the calyx. *Capsule* membranous, pubescent. DC. Prod. i. 493; W. & A. Prod. i. 67; Mast. in Hook. fil. Fl. Br. Ind. i. 374; Miq. Fl. Ind. Bat. i. pt. 2, p. 187; Wall. Cat. 1194. *W Americana*, L. DC. Prod. i. 492. *W. elliptica*, Cav. Diss. vi. 171; Wall. Cat. 1195.

In all the Provinces: a weed. Distrib. The Tropics generally.

9. Abroma, Jacq.

Trees or shrubs. *Leaves* cordate, ovate-oblong, serrulate, sometimes angled. *Peduncles* opposite the leaves, few-flowered. *Sepals* 5, connate near the base. *Petals* 5, purplish, concave below, prolonged above into a large spoon-shaped lamina. *Staminal-cup* of 5 fertile and as many sterile divisions; fertile filaments opposite the petals, 3-antheriferous; anthers 2-lobed, lobes divergent. *Staminodes* longer than the fertile filaments, obtuse. *Ovary* sessile, pyramidal, 5-lobed; cells many-ovuled, styles 5. *Capsule* membranous, 5-angled, 5-winged, truncate at the apex, septicidally 5-valved, valves villous at the edges. *Seeds* numerous, albuminous; embryo straight, cotyledons flat, cordate, radicle next the hilum.—Distrib. 2 or 3 species, natives of Tropical Asia.

1. A. augusta, Linn. fil. Suppl. 341. A pubescent large shrub or small tree: young branches pale. *Leaves* 5 to 7-nerved at the base, 3·5 to 6 in. long and 3 to 5 in. broad; petiole 1·75 to 2·5 in., the upper much smaller and narrower. *Stipules* linear, deciduous. *Flowers* 2 in. in diam., peduncles 1·5 in., extra-axillary. *Sepals* 1 in. long, lanceolate, free to nearly the base. *Petals* longer than the sepals, imbricate, deciduous. *Capsule* 1·5 to 2 in. in diam., glabrous or nearly so when ripe. DC. Prod. i. 485; Mast. in Hook. Fl. Br. Ind. i. 375; Bl. Bijdr. 85; Roxb. Hort. Beng. 50; Fl. Ind. iii. 156; Miq. Fl. Ind. Bat. i. pt. 2, 183; Beddome Flor. Sylvat. Anal. Gen. t. 5; W. & A. Prodr. i. 65; Wall. Cat. 1142. *A. angulata*, Lam. Ill. 636. *A. Wheeleri*, Retz. Obs. v. 27; Willd. Sp. Pl. iii. 1425. *A. fastuosum*, Gærtn. Fruct. i. 307, t. 64.

In all the Provinces at low elevations: usually near cultivation. Distrib. Malayan Archipelago, Philippines, China, Brit. India.

The bark yields a stout fibre.

10. Buettneria, Linn.

Erect climbing or tomentose shrubs, herbs, or trees; sometimes prickly. *Leaves* various. *Flowers* minute, in axillary or terminal much-branched, umbellate cymes. *Sepals* 5, slightly connate near the base. *Petals* 5, unguiculate, concave, inflexed, with 2 small lateral lobes, and a long sub-terminal simple linear or narrowly lanceolate appendage. *Staminal tube* with 5 broad truncate or emarginate teeth and, between them, five 2-celled extrorse anthers (mouth entire in *B. Curtisii*). *Ovary* sessile, 5-celled, the cells 2-ovulate. *Style* entire, 5-fid. *Capsule* globose, echinate, septicidaly 5-valved, the cells 1-seeded. *Seed* ascending, exalbuminous: cotyledons folded round the radicle. Distrib. About 48 species, mostly tropical American: a few tropical Asiatic and one African.

Leaves longer than broad, their bases not cordate or only minutely so.
Staminal tube with entire mouth ... 1. *B. Curtisii.*
Staminal tube with its mouth 5-lobed.
Leaves quite glabrous.
Capsule less than 1 in. in diam., covered with glandular barbed spines ... ... 2. *B. uncinata.*
Capsule more than 1 in. in diam., covered with short subulate spines ... ... 3. *B. Maingayi.*
Leaves more or less minutely hispid on both surfaces ... 4. *B. elliptica.*
" hispid on the upper, hispid-tomentose on the lower, surface ... ... 5. *B. Jackiana.*
Leaves about as broad as long, deeply cordate at the base.
Leaves glabrous, or glabrescent, not lobed ... ... 6. *B. aspera.*
" sparsely pubescent, often lobed ... ... 7. *B. Andamanensis.*

1. B. CURTISII, Oliver in Hook. Ic. Pl. t. 1761. A slender woody creeper, 10 to 15 feet long: young branches minutely puberulous. *Leaves* linear-lanceolate or oblanceolate-oblong, rarely ovate-oblong, acuminate, entire, narrowed to the sub-obtuse, minutely cordate, 5-nerved base: lateral nerves numerous, unequal and spreading at various angles, reticulations distinct: both surfaces glabrous, the lower with tufts of stellate hairs in the axils of the leaves; length 2·5 to 7 in., breadth ·5 to 2 in.; petiole ·25 in., pubescent. *Cymes* in axillary fascicles of 2 to 4, slender, 3 to 7-flowered, puberulous; peduncles about 1 in. long: flower pedicels ·25 in. *Flowers* ·45 in. in diam., buds conical. *Calyx* deeply 5-partite, the segments ovate-lanceolate, acuminate. *Petals* strap-shaped with 2 rather broad inflexed lateral lobes, and a long cylindric curved sub-terminal appendage, about as long as the sepals. *Capsule* globular, about 1 in. in diam., veined, pubescent, and armed with numerous straight smooth bristles.

Penang, Curtis, Nos. 817 and 1166; Perak, common at low elevations.

This is closely allied to the Bornean *B. lancifolia*, Hook. fil. The leaves vary a good deal in shape, the most prevalent form in the Perak specimens being linear-lanceolate. The Penang specimens are, on the other hand, as figured by Professor Oliver, oval-oblong.

2. B. UNCINATA, Mast. in Hook. fil. Fl. Br. Ind. i. 377. A woody climber: young branches at first scurfy and hispid, but very soon glabrous. *Leaves* sub-coriaceous, elliptic-oblong; gradually tapering in the upper third to the acuminate apex, entire, the base slightly cuneate, 3-nerved; both surfaces glabrous and shining, nerves 9 or 10 pairs, spreading, thin but prominent beneath: length 9 to 11 in., breadth 3 in., petiole nearly 3 in., thickened at the apex, glabrous. *Sepals* lanceolate, spreading, hispid. *Fruiting peduncles* (fide Masters) "half the length of the leaves. *Capsule* depressed-spheroidal, the size of a hazel-nut, covered with hooked gland-tipped barbed hispid spines, 3-celled."

Malacca, Maingay, No. 242 (Kew Distrib.).

I have seen only Maingay's Malacca specimens.

3. B. MAINGAYI, Mast. in Hook. fil. Fl. Br. Ind. i. 377. A woody climber: young branches glabrous. *Leaves* sub-coriaceous, elliptic to elliptic-oblong, shortly bluntly and rather abruptly acuminate, entire; the base rounded with 3 bold and 2 minute nerves: both surfaces quite glabrous; lateral nerves about 2 or 3 pairs, prominent beneath as are the reticulations; length 7 or 8 in., breadth 3 to 3·5 in.; petioles 1·2 in., thickened towards the apex, glabrous. *Umbels* in axillary fascicles of 6 or 8, their peduncles about 1 in. long, slender, glabrescent; pedicels ·25 in. *Sepals* ·25 in. long, ovate-lanceolate. "*Petals* shorter than the sepals, with a long linear appendage. *Staminodes* erect, oblong, obtuse, bifid. *Style* as long as the ovary. *Fruiting peduncle* as long as the petiole. *Capsule* globose, 1·25 in. in diam., obscurely 5-lobed, studded with short subulate prickles."

Malacca; Griffith, Maingay.

Of this species I have seen no good specimens in flower or fruit, and the above account of these parts is taken from Masters' description.

4. B. ELLIPTICA, Mast. in Hook. fil. Fl. Br. Ind. i. 377. A woody climber; young branches minutely rusty-tomentose. *Leaves* broadly elliptic, abruptly and shortly acuminate, entire; the base 5-nerved, rounded or minutely cordate; upper surface minutely scabrid-hispid, the midrib and nerves hispid-tomentose; lower minutely pubescent on the veins, the midrib and longer nerves tomentose: lateral nerves 3 pairs, oblique, curving, prominent beneath as are the secondary nerves and reticulations: length 5·5 to 7·7 in., breadth 3·5 to 4·75 in., petiole

2 to 3 in., tomentose. *Umbels* pedunculate, solitary or in fascicles of 5 or 6, axillary, few-flowered, stellate-tomentose: peduncles ·5 to 1 in.; pedicels ·1 to ·25 in., both slender. Buds ·1 in. in diam. *Sepals* ovate, acute. *Petals* rounded, with long cylindric inflexed apices longer than the sepals. *Fruit* unknown.

Malacca, Maingay: No. 241 (Kew Distrib.). Perak; Scortechini.

Evidently a rare species; for I have seen, besides Maingay's, only Scortechini's solitary specimen.

5. B. JACKIANA, Wall. in Roxb. Fl. Ind. (ed. Carey) ii. 386. A stout woody creeper, the young branches with densely minute ferruginous tomentum some of which is stellate. *Leaves* narrowly or broadly elliptic, acuminate, entire; the base boldly 3-nerved, rounded, sometimes slightly cordate, rarely acute; upper surface sparsely and shortly hispid; under surface rufous, hispid-tomentose especially on midrib and nerves, many of the hairs on both surfaces stellate; lateral nerves 3 or 4 pairs, curved, spreading; length 3·5 to 6 in., breadth 2 to 3·75 in.; petiole ·4 to 1 in. tomentose. *Umbels* pedunculate, solitary or in groups of 3 or 4 from the leaf-axils, few-flowered, tomentose: peduncles ·25 to 1 in. long; pedicels about ·35, slender. *Sepals* linear-subulate, spreading, hispid, about ·4 in. long. *Petals* sub-rotund, lobed, each with a single long cylindric terminal appendage as long as the sepals. *Capsule* globose, slightly 5-furrowed, 1 in. in diam., black, glabrescent, armed with many straight spines. *Seeds* oblong, black. Mast. in Hook. fil. Fl. Br. Ind. i. 376; Wall. Cat. 1147.

Penang, Perak and Singapore; at low elevations.

6. B. ASPERA, Colebr. in Roxb. Fl. Ind. (ed. Carey), ii. 383. A powerful woody climber often with a tree-like stem; young branches glaucous, minutely and deciduously pubescent. *Leaves* sub-orbicular or ovate-orbicular, shortly acuminate, entire, the base cordate, 5 to 7-nerved; upper surface glabrous, shining; the lower glabrescent, the midrib and nerves puberulous; lateral nerves 4 to 6 pairs, prominent beneath as are the stout transverse veins; length 4·5 to 7·5 in., breadth about the same: petiole 2 to 5 in., glaucous-pubescent at first, afterwards glabrous. *Cymes* axillary, solitary or fasciculate, pedunculate, much branched, many-flowered, pubescent to tomentose, 3 or 4 in. long: ultimate pedicels ·5 in. long, slender. *Sepals* lanceolate, acute, spreading, ·15 in. long, puberulous externally. *Petals* cuneate, shorter than the sepals, 3-lobed, the middle lobe linear-lanceolate, reflexed. *Staminodes* truncate. *Ovary* globular, scabrid. *Capsules* globular, 1·5 to 2 in. in diam., slightly depressed, pubescent when young, glabrous when ripe,

armed with many long, nearly straight, sharp spines. *Seeds* oblong, ·5 in. or more long. Wall Cat. 1144; Mast. in Hook. fil. Fl. Br. Ind. i. 377; Kurz For. Fl. Burm. i. 151; Pierre Fl. Forest. Coch-Chine, t. 206, figs. 1 to 8. *B. grandifolia*, DC. Prodr. i. 486. *B. nepalensis*, Turcz. in Bull. Mosc, 1858, 207.

Andaman Islands. Distrib. Brit. India, China, Cochin-China.

7. B. ANDAMANENSIS, Kurz in Journ. As. Soc. Bengal, 1871, ii. 47. A woody climber: young branches scaberulous. *Leaves* sub-orbicular, crenate and palmately 3 to 5-lobed, the lobes acuminate; or ovate-rotund, acuminate and irregularly serrate-crenate and not lobed; the base always deeply cordate, 5 to 7-nerved; lateral nerves about 5 pairs, opposite, prominent beneath as are the midrib and straight transverse veins: both surfaces sparsely pubescent at first, but afterwards glabrous. *Cymes* umbellate, 2 or 3 times branched, spreading, many-flowered, solitary, or 2 or 3 in a fascicle, axillary: the common peduncle stout, ·6 to ·75 in. long; secondary peduncles about the same length, tertiary half as long: flower-pedicels ·15 in., all slender and slightly pubescent. *Sepals* ovate acuminate or deltoid, puberulous externally. *Petals* with 2 obscure lateral lobes, and a long lanceolate inflexed middle lobe. *Staminodes* truncate. *Capsule* globose, less than 1 in. in diam, glaucous when young, armed with a few unequal, rather short, smooth, stiff spines. Kurz in Flora, 1871, p. 277; For. Fl. Br. Burm. i. 152; Mast. in Hook. fil. Fl. Br. Ind. i. 377; Pierre Fl. Forest. Coch-Chine, t. 207, figs. 1 to 9..

Andaman Islands. Distrib. Burmah, Siam, Cochin-China.

11. COMMERSONIA, Forsk.

Trees or shrubs. *Leaves* simple, oblique. *Inflorescence* cymose, terminal or axillary or leaf opposed. *Calyx* 5-cleft. *Petals* 5, concave at the base, prolonged into a long strap-shaped appendage at the apex. *Fertile stamens* 5, opposite the petals; anthers subglobose, 2-celled, cells diverging; staminodes 5, opposite to the sepals, lanceolate. *Carpels* 5, opposite to the sepals, connate; *styles* connate; ovules 2-6. *Capsule* loculicidally 5-valved, covered with bristly hairs. *Seeds* ascending, albuminous, strophiolate; cotyledons flat, radicle next the hilum. Distrib. A genus of about 8 species, some of which are natives of the Malay peninsula and Archipelago, others of Australia.

C. PLATYPHYLLA, Andr. Bot. Rep. t. 603 (note). A low tree; young branches softly rusty-tomentose. *Leaves* membranous, inequilateral, ovate-acuminate, irregularly dentate-serrate; the base more or less cordate, one side sub-auriculate, upper surface sparsely and minutely stellate-hairy, lower softly hoary tomentose: length 5 to 8 in., breadth 3 to 4·5 in., petioles ·2 to ·3 in.; stipules shorter than the petioles, scarious, lobed. *Cymes* corymbose, much shorter than the leaves, spreading, much branched, tomentose. *Flowers* ·2 or ·25 in. in diam *Calyx* pubescent, cut nearly to the base into 5 ovate-lanceolate lobes. *Petals* as long as the sepals but much narrower, concave at the base; the terminal appendage elongate, narrowly oblong, its edges inflexed. *Stamens* 5, the anthers broad, extrorse. *Staminodes* 5, lanceolate, spreading, reflexed, shorter than the petals. *Ovary* 5-celled. *Capsule* globose, ·4 or ·5 in. in diam., densely covered with long soft, flexuose, pubescent bristles. Mast. in Hook. fil. Fl. Br. Ind. i. 378. *C. Javensis*, G. Don. Gen. Syst. i. 523; Hassk. Pl. Jav. Rar. 312. *C. echinata*, Blume Bijdr. 86; Wall. Cat. 1143; Andr. Bot. Rep. t. 519, not of Forst. *C. echinata*, var. *β.* Miq. Fl. Ind. Bat. i. pt. 2, 182. *Buettneria hypoleuca*, Turcz. in Mosc. Bull. 1858, 207.

In all the provinces except the Andamans and Nicobars. Distrib. Malayan Archipelago, Philippines.

12. LEPTONYCHIA, Turcz.

Shrubs or trees. *Leaves* simple, entire. *Flowers* in small axillary cymes. *Sepals* 5, valvate, united near the base. *Petals* 5, valvate, short, orbicular, concave. *Andrœcium* tubular below, filamentiferous above, filaments 3-seriate, outer series of 5 to 10 ligulate staminodes opposite the petals, middle of 10 fertile stamens also opposite the petals, innermost of 5 very short fleshy subulate staminodes opposite the sepals; anthers linear-oblong, introrse, dehiscing at the sides longitudinally. *Ovary* sessile, 3-4-celled; placentas axile; styles connate, stigmas capitellate; ovules many in each cell, anatropous. *Capsule* 2-3-celled, or by abortion 1-celled, dehiscing septicidally or loculicidally, or both simultaneously or irregularly. *Seeds* black, with a fleshy yellowish arillus; albumen fleshy, cotyledons foliaceous, radicle superior. Distrib. three or four species—Indo Malayan and Tropical African.

L. GLABRA, Turcz. in Mosc. Bull. for 1858, p. 222. A tree: the young branches glabrous. *Leaves* ovate-oblong or oblong-lanceolate, rather abruptly acuminate, the base slightly narrowed or rounded, 3-nerved; both surfaces glabrous, shining; main nerves 4 to 7 pairs, thin: length 4 to 8 in., breadth 1·6 to 3 in.; petiole ·4 to ·5 in., glabrous. *Flowers* ·25 in. in diam.; the buds oblong, obtuse, 5-ridged. *Sepals* ovate-lanceolate or oblong, rather obtuse, spreading, pubescent on both surfaces, not veined. *Petals* about one-fourth the size of the sepals, broad, truncate, villous. *Stamens* 10, in five phalanges of two each, nearly as long as the sepals. *Staminodes* 10 to 20, glabrous, the outer 5 to 15 shorter than, or as long as, the stamens, filiform; the inner invariably 5, short, subulate, internal to, and alternating with, the phalanges of stamens. *Ovary* broadly obovate, obtuse, obscurely 4-grooved, with a few scattered hairs near the apex, 4-celled. *Style* cylindric, tapering, with sparse spreading hairs. *Capsule* coriaceous, depressed-obovoid, pale greyish, ·5 in. long, rugose; within shining pale and wrinkled. *Seed* solitary, oblong, black, less than half covered by a thin arillus proceeding from its side. Mast. in Hook. fil. Fl. Br. Ind. i. 379; Kurz For. Fl. Burm. i. 150; Oudem. in Compt. Rend. Ac. Roy. Sc. Amsterd. 2 Ser., 11, 8, cum ic; Walp. Ann. vii. 449. *Grewia ? caudata*, Wall. Cat. 1099. *L. heteroclita*, Kurz For. Fl. Burm. i. 150. *G. heteroclita*, Roxb. Fl. Ind. ii. 590. *Binnindykia trichostylis*, Kurz in Nat. Tijdsc. Ned. Ind., Ser. 3, iii. 164. *Turræa trichostylis*, Miq. Fl. Ind. Bat. Suppl. 502.

Malacca, Penang, Perak, Andamans; at low elevations. Distrib. Malayan Archipelago, Burma.

Var. *Mastersiana*, young branches, midribs and petioles of leaves puberulous; flowers ·5 in. in diam., the buds pointed; sepals 3-veined: outer staminodes varying from 5 to 15, often pubescent in the upper half: ovary oblong-ovoid, villous, 3-celled: style glabrous: capsule black. *L. acuminata*, Mast. in Hook. fil. Fl. Br. Ind. i. 379.

Malacca and Perak. Distrib. Sumatra, Borneo, Burmah.

This shrub or small tree is common, and I have thus had the advantage of being able to examine a large number of flowers. The result of my examination of these is that, whereas the inner staminodes are invariably 5 in number, the outer series varies in number in the most perplexing way from 5 to 15. Where there are 10, they are always arranged in pairs united at the base: and where there are 15, they are arranged in threes united at the base. The proper view to take of these staminodes is I believe therefore that they are single organs, but sometimes deeply cleft into 2 or 3 linear and equal segments. On this account, and also on account of the similarity of the other organs, I am induced to think that there is but *one* species of *Leptonychia* and that Masters' species *acuminata* and Beddome's *L. moacurroides* are merely forms of the species on which Turczaninow originally founded the genus.

ORDER XIX. TILIACEÆ.

Trees, shrubs or herbs. *Leaves* alternate, rarely opposite, simple or lobed. *Stipules* free, usually caducous. *Flowers* usually cymose, or in cymose panicles, or racemose. *Flowers* regular, hermaphrodite, rarely unisexual. *Sepals* 3-5, free or connate, valvate. *Petals* as many as the sepals, rarely absent, imbricate or valvate. *Stamens* numerous, rarely definite, usually springing from a prolonged or dilated torus, free or sometimes 5-adelphous, filaments filiform; anthers 2-celled. *Ovary* free, 2-10-celled; styles columnar, or divided into as many divisions as there are cells to the ovary, stigmas usually distinct, rarely confluent or sessile. *Ovules* attached to the inner angle of the cells of the ovary; if few in number, often pendulous from the apex or ascending from the base; if more numerous, disposed in 2 or more ranks, anatropous; raphe ventral or lateral. *Fruit* fleshy or dry, dehiscent or indehiscent, 2-10 or by abortion 1-celled (cells sometimes divided by false partitions); carpels separable or always united. *Seeds* 1 or many, ascending, pendulous or transverse, with no arillus; testa leathery or crustaceous or pilose; albumen fleshy, abundant or scanty, rarely wanting; embryo straight or slightly curved, cotyledons leafy, rarely fleshy, radicle next the hilum.—Distrib. about 370 species; most abundant in the tropics of either hemisphere.

Series A. *Holopetalæ.* *Petals* glabrous or rarely downy, coloured, thin, unguiculate, entire or nearly so, imbricate or twisted in the bud. *Anthers* globose or oblong, opening by slits.

Tribe I. *Brownlowieæ.* *Sepals* combined below into a cup. *Anthers* globose, cells ultimately confluent at the top.

* *Staminodes* 5.

Carpels distinct, 2-valved ... ... 1. *Brownlowia.*
Carpels combined, indehiscent, winged ... 2. *Pentace.*

** *Staminodes* 0.

Stamens on a raised torus ... ... 3. *Schoutenia.*
Stamens on a contracted torus ... ... 4. *Berrya.*

Tribe II. *Grewieæ.* *Sepals* distinct. *Petals* glandular at the base. *Stamens* springing from the apex of a raised torus.

Fruit drupaceous, not prickly ... ... 5. *Grewia.*
Fruit dry indehiscent or 3-5 coccous, prickly 6. *Triumfetta.*

Tribe III. *Tilieæ.* *Sepals* distinct: petals not glandular. *Stamens* springing from a contracted torus.

Herbs or undershrubs with 3 or 5-celled capsules: seeds without hairs ... 7. *Corchorus.*
Trees with 2-celled capsules; seeds with marginal hairs ... ... 8. *Trichospermum.*

Series B. *Heteropetalæ.* *Petals* usually incised, rarely entire or absent, induplicate or imbricate not twisted: anthers linear, opening by a terminal pore often with an apical awn or tuft of hairs.

Stamens on a raised torus; fruit drupaceous 9. *Elæocarpus.*

1. BROWNLOWIA, Roxb.

Trees. *Pubescence* stellate or scaly. *Leaves* entire, 3-5-nerved, feather-veined. *Flowers* numerous, small, in large terminal or axillary panicles. *Calyx* bell-shaped, irregularly 3-5-fid. *Petals* 5, without glands. *Stamens* many, free, springing from a raised torus. *Staminodes* 5, within the stamens, opposite the petals and petaloid. *Anthers* sub-globose. *Ovaries* 5, each 2-ovulate; styles awl-shaped, slightly coherent; ovules ascending. *Carpels* ultimately free, 2-valved, 1-seeded. *Albumen* 0; cotyledons thick, fleshy.—Distrib. Nine species confined to Tropical Asia.

Leaves not peltate.	
Leaves lanceolate	1. *B. lanceolata.*
„ broadly elliptic to elliptic-rotund	2. *B. Kleinhovioidea.*
Leaves peltate.	
Leaves minutely hairy beneath ...	3. *B. Scortechinii.*
„ glabrous on both surfaces ...	4. *B. macrophylla.*

1. BROWNLOWIA LANCEOLATA, Benth. in Journ. Linn. Soc. V. Suppl. ii. 57. A tree 25 to 30 feet high; young branches pale when dry, sub-lepidote. *Leaves* thinly coriaceous, lanceolate or oblong-lanceolate, acuminate, the base obtuse; upper surface when adult glabrous, shining, the lower covered by a dense layer of minute whitish yellow shining scales: main nerves 6 to 8 pairs (1 pair of them basal), not prominent: length 4·5 to 6 in., breadth 1·5 to 1·75 in., petiole ·25 to ·4 in. *Panicles* axillary or terminal, 1 to 3 in. long, and less than 1 in. across, few-flowered. *Flowers* ·25 in. long, their pedicels about as long. *Calyx* ·2 in. long, scaly like the pedicel, its lobes lanceolate. *Petals* longer than the calyx, oblong, blunt, slightly narrowed to the shortly unguiculate base, glabrous. *Anther-cells* sub-divaricate, sub-confluent when adult. *Ovary* deeply 3 to 5-lobed, pubescent, the cells 2-ovuled. *Ripe carpels* distinct, sub-globose, truncate, compressed on their inner surfaces, minutely lepidote and pubescent, ·5 in. in diam. *Seed* solitary, with thin testa and large sub-hemispheric cotyledons. Hook. fil. Fl. Br. Ind. i. 381: Kurz For. Flora Burm. 154.

Malacca, Griffith. Distrib. Burmah and Bengal; in tidal forests and mangrove swamps.

The young parts are covered with rusty or pale brown scales, but the adult branchlets leaves and flowers are as above described.

2. BROWNLOWIA KLEINHOVIOIDEA, King, n. sp. A tree 40 to 50 feet high: young branches rather slender, covered with a dense thin layer of

minute pale brown hair. *Leaves* thinly coriaceous, broadly elliptic to elliptic-rotund, slightly narrowed to the obtuse apex, very little narrowed to the more or less cordate base: upper surface glabrous, very sparsely lepidote, the lower covered with a thin layer of very minute pale hair; basal nerves 4 or 6 (two of them small): main lateral nerves 3 pairs; transverse secondary nerves distinct: length 5 to 7 in., breadth 3·5 to 4·5 in.; petiole 2·5 to 3 in., thickened towards the apex, pubescent like the under surfaces of the leaves. *Panicles* mostly terminal, rarely axillary, 9 to 15 in. long (the axillary ones much smaller) the branches rather few, spreading little, the flowers rather closely clustered on the branchlets. *Flowers* ·25 in. long, on pedicels about half as long. *Calyx* widely campanulate, cut for a third of its length into 5 acute triangular teeth, minutely tomentose externally, glabrous inside. *Petals* longer than the calyx, oblong, very obtuse, slightly narrowed but thickened towards the rather long basal claw. *Staminodes* linear, flat, about as long as the filaments. *Ovaries* 3 to 5, sub-globose, laterally compressed, pubescent. *Styles* subulate, a little longer than the stamens, slightly coherent. *Fruit* unknown.

On Gunong Bubu in Perak, at elevations of 600 to 1000 feet; King's Collector.

A species with leaves not unlike these of *Kleinhovia hospita:* in many respects closely allied to *B. elata*, but with much smaller flowers.

3. **Brownlowia Scortechinii**, n. sp., King. A small slender tree: young branches stout, pale, sparsely lenticellate, pubescent at first but soon glabrous. *Leaves* coriaceous, ovate-elliptic, peltate, slightly narrowed to the acute or sub-acute apex; the edges sub-undulate; very little narrowed to the rounded, or sometimes sub-emarginate, base; upper surface glabrous; the lower pale from a thin continuous layer of very minute hairs; petiole attached 2·5 to 3 in. above the base, nerves radiating from it about 9, lateral nerves from the midrib about 4 pairs; all rather prominent beneath, as are the transverse secondary nerves: length 10 to 15 in., breadth 5·5 to 7 in., petiole 7 to 9 in. long, thickened at both ends. *Panicle* terminal, 6 to 12 in. long and about 6 in. broad, or sometimes small narrow panicles in terminal clusters of 6 to 10: branches spreading, compressed, puberulous; bracteoles ovate, fugaceous; pedicels, stout, ·15 in. long in the bud but lengthening as the flower expands, puberulous. *Flowers* ·6 in. long, crowded. *Calyx* narrowly campanulate; its teeth half as long as the tube, lanceolate, sub-acute, tomentose-lepidote externally. *Petals* longer than the calyx, narrowly obovate, much narrowed to the clawed base. *Staminodes* linear, about as long as the filaments. *Ovaries* 5, ovoid, compressed, stellate-pubescent.

Styles slightly longer than the stamens, subulate, bent at the apex. *Fruit* unknown.

Perak; Scortechini, No. 1918.

Collected only once by the late Fr. Scortechini and referred by him to *B. elata*, Roxb. The species is, however, quite distinct from *B. elata*; and also from *B. peltata*, which it more resembles in its leaves.

4. BROWNLOWIA MACROPHYLLA, King n. sp. A tree 30 to 40 feet high: young branches very stout, deciduously rufous-puberulous. *Leaves* very coriaceous, rotund, those on the older branches elliptic, the apex rounded or very slightly and shortly apiculate, the edges sub-undulate, the base broad, emarginate or slightly cordate, both surfaces glabrous; main nerves 7 to 9 basal and about 2 pairs lateral, prominent on both surfaces, secondary nerves transverse and very distinct: length of the rotund leaves 11 to 17 in., breadth 10 to 14: of the elliptic, length 6 to 10 in., breadth 3·5 to 5·5 in.: petiole 2·25 to 4·5 in., thickened at both ends. *Panicle* terminal, almost as long as the leaves, its branches numerous, compressed, grooved, spreading, scurfy and rusty-pubescent: bracts few, linear-lanceolate, nearly 1 in. long, persistent. *Flowers* ·65 in. long: their peduncles shorter than the calyx, stout, deeply grooved. *Calyx* rather widely cylindric-campanulate, its teeth about half as long as the tube, acute, triangular, rusty-tomentose and scurfy externally. *Petals* oblong, obtuse, very little narrowed to the base and without any very distinct claw. *Ovaries* 3 to 5, narrowly ovoid, compressed, vertically ridged, lepidote as are the conjoined styles. *Fruit* sub-globose, much compressed, covered with a layer of very minute pale hairs, ·75 in. in diam.

Perak, at low elevations and in moist ground; Scortechini, Wray, King's Collector.

2 PENTACE, Hassk.

Trees. Herbaceous portions sometimes pubescent or scaly, ultimately glabrous. *Leaves* entire, leathery, the lower surface (except in one species) pale from a thin layer of minute adpressed scaly hair. *Flowers* numerous, small, in terminal panicles. *Calyx* bell-shaped, usually 5-fid. *Petals* 5, membranous, glabrous, longer than the calyx, glandless. *Stamens* numerous, on a slightly raised torus, usually pentadelphous. *Staminodes* 5, opposite the sepals. *Anthers* subglobose; pollen globose, 3-pored. *Ovary* 5-celled, cells 2-ovuled; ovule pendulous, raphe next the placenta. *Styles* united, rarely free. *Fruit* dry, indehiscent, 3-10-winged, 1-celled, 1-seeded by abortion. *Seed* solitary, albuminous.—Distrib. About 15 species, all Malayan.

Leaves with pinnate nervation.
Ovary 3-ridged... ... ... 1. *P. triptera.*
Ovary 5-ridged.
Leaves with 6 or 7 pairs of nerves... 2. *P. Hookeriana.*
,, ,, 3 or 4 ,, ... 3. *P. Kunstleri.*
Ovary 10-ridged ... ... 4. *P. perakensis.*
Leaves boldly 5-nerved at the base, lateral nerves from the central nerve (midrib) 3 pairs; 7 to 14 in. long; ovary 5-ridged... 5. *P. macrophylla.*
Leaves boldly 8-nerved at the base; the central nerve (midrib) with 1 or 2 pairs of lateral nerves: rarely more than 7 in. long.
Ovary not visibly ridged ... ... 6. *P. floribunda.*
Ovary 8 or 9-ridged.
Styles quite confluent ... ... 7. *P. Curtisii.*
,, free... ... ... 8. *P. eximia.*
Ovary 10-ridged.
Leaves glabrous on both surfaces ... 9. *P. Scortechinii.*
,, with a dense layer of minute adpressed hair on the under surface ... ... 10. *P. Griffithii.*
Leaves boldly 3-nerved at the base, the central nerve (midrib) without lateral nerves, only 3 or 4 in. long; ovary 5-ridged 11. *P. strychnoidea.*

1. PENTACE TRIPTERA, Mast. in Hook. fil. Fl. Br. Ind. i. 382. A large tree: young branches pubescent, speedily becoming glabrous, their bark dark-coloured. *Leaves* ovate to ovate-rotund, sometimes ovate-oblong, sub-acute or shortly and bluntly acuminate, the margins undulate, the base rounded; upper surface glabrous, the lower pale, minutely scaly; basal nerves one or two pairs; lateral 5 to 7 pairs, ascending, straight; length 4 to 5 in., breadth 2 to 2·75 in.; petiole ·6 to 1·2 in. thickened towards the apex, pubescent. *Panicles* terminal and axillary, 6 to 8 in. long, with short many-flowered branches minutely and softly stellate-tomentose. *Flowers* nearly ·2 in. long, on pedicels shorter than the calyx. *Calyx* with 5 lanceolate teeth, tomentose outside. *Petals* spathulate-oblong, obtuse. *Stamens* 5-delphous, longer than the style. *Staminodes* subulate, shorter than the stamens. *Ovary* densely tomentose, shortly 3-winged. *Style* filiform, glabrous, bent at the apex. *Fruit* oblong, narrow, ·6 in. long, with 3 spreading membranous rounded wings ·5 in. broad.

Malacca; Griffith, Maingay. Perak: Scortechini.

This approaches the Javan *P. polyantha*, Hassk., which has, however, larger flowers with a shallower calyx with longer teeth, a shorter style, and a 5-lobed ovary.

2. PENTACE HOOKERIANA, n. sp., King. A tree 30 to 40 feet high: young branches cinereous, glabrous. *Leaves* elliptic-oblong, slightly obovate, acute, the base narrowed and slightly unequal; upper surface glabrous, the lower dull; lateral main nerves about 6 pairs (one of the pairs basal), prominent on both surfaces; the intermediate nerves, transverse veins and reticulations prominent only on the lower: length 5 to 7·5 in.; breadth 2 to 2·75 in.; petiole ·25 in., stout. *Panicles* terminal and in the axils of the upper leaves, 2·5 to 5 in. long, the branches spreading, everywhere scurfy-tomentose. *Flowers* rather crowded, ·2 in. long, on pedicels shorter than the calyx. *Calyx* campanulate, cut half-way down into 3 or 4 broadly triangular sub-acute spreading teeth, scaly and minutely tomentose outside. *Petals* narrowly obovate. *Stamens* 15 in 5 bundles of 3 each, very much shorter than the petals. *Staminodes* thick, orbicular, embracing the ovary. *Ovary* depressed-globose, densely pubescent, obscurely 5-lobed, 5-celled. *Styles* 5, free, shorter than the ovary. *Fruit* unknown.

Perak, on the banks of the Kinta river: King's Collector, No. 815.

3. PENTACE KUNSTLERI, n. sp., King. A tree 30 to 40 feet high: young branches slender, dark-coloured, glabrous. *Leaves* broadly ovate, with an abrupt short broad blunt acumen, the base rounded: upper surface shining, glabrous, the lower dull; lateral nerves 3 or 4 pairs, curved, prominent beneath; sometimes a pair of short slender sub-marginal nerves at the base: length 4·5 to 6 in., breadth 2·5 to 3·5 in.; petiole ·75 to 1 in., stout, thickened at the apex. *Panicles* terminal, 3·5 to 6 in. long, puberulous, much-branched. *Flowers* numerous, ·15 in. long, the pedicels slightly shorter. *Calyx* tubular-campanulate, minutely stellate-hairy and lepidote outside; the teeth triangular, acute, erect. *Petals* spathulate with a very long claw. *Stamens* in 5 bundles. *Staminodes* linear-lanceolate, as long as the filaments. *Ovary* depressed-globose, with 5 blunt angles, lepidote and pubescent, 5-celled. *Style* straight, glabrous. *Fruit* unknown.

Perak, at a very low elevation; King's Collector, No. 6871.

4. PENTACE PERAKENSIS, n. sp., King. A tree 30 to 40 feet high: young branches cinereous, glabrous. *Leaves* ovate-elliptic, slightly oblique, bluntly acuminate, the base rounded or sub-cuneate: upper surface shining, glabrous: the lower dull; lateral nerves about 5 pairs,

ascending, curved; length 5 to 6 in., breadth 2·5 to 3 in.; petiole ·75 to 1 in., stout, and thickened at the apex. *Panicles* terminal, 4 to 5 in. long and less than 2 in. wide, little branched and few-flowered. *Flowers* about ·1 in. long, their pedicels about as long. *Calyx* rotate, minutely lepidote outside; the teeth triangular, spreading. *Petals* ovate, narrowed to a short claw. *Stamens* about 30, 5-delphous. *Staminodes* lanceolate, as long as the filaments. *Ovary* globose, slightly pointed, 10-ridged, slightly hairy, 5-celled. *Style* about as long as the ovary, cylindric. *Stigma* terminal, small. *Fruit* unknown.

Perak, King's Collector, No. 3428.

5. **Pentace macrophylla**, n. sp., King. A tree usually from 20 to 30 feet high, but occasionally as much as 50 feet. Young branches rather slender, pale brown, glabrous. *Leaves* large, ovate-elliptic to almost rotund, the apex very shortly and abruptly blunt-acuminate, the base rounded: upper surface glabrous; the lower dull; basal nerves 2 pairs, the upper branched on one side; lateral nerves from the midrib 2 to 3 pairs, all ascending and little curved, prominent beneath; length 7 to 14 in., breadth 5 to 12 in.; petiole 2·5 to 3 in., stout. *Panicles* terminal and axillary, 6 to 15 in. long, lax, spreading, minutely yellowish-pubescent and scurfy. *Flowers* ·15 in. long and ·2 in. in diam., on pedicels about as long as the calyx. *Calyx* almost rotate, cut for two-thirds of its length into 5 lanceolate acute teeth, minutely yellowish-tomentose outside. *Petals* oblanceolate, obtuse. *Staminodes* linear, as long as the stamens. *Stamens* in 5 bundles of about 15 each. *Ovary* ovoid, scaly and pubescent, obtusely 5-angled. *Style* rather shorter than the stamens, cylindric, pointed. *Fruit* ·75 in. long with 10 radiating semi-elliptic striate sparsely scaly wings each ·4 in. wide.

Perak at elevations up to 500 feet; King's Collector, Scortechini, Wray: common.

Distinguished from all the other known species by the large size of its leaves.

6. **Pentace floribunda**, n. sp., King. A tree 40 to 70 feet high: young branches slender, sparsely stellate-puberulous, the bark dark-coloured. *Leaves* elliptic-oblong to elliptic-rotund, the apex shortly and rather abruptly apiculate; the base rounded or slightly narrowed; upper surface glabrous, lower cinereous and with some scattered pubescence; basal nerves 2 pairs, one of them branching on one side: lateral nerves 2 or 3 pairs, all ascending and all rather prominent: transverse veins not prominent; length 5 to 6·5 in., breadth 2·5 to 3·75 in., petiole 1 to 2 in., thickened towards the apex. *Panicles* towards the apices of the

branches, axillary and terminal, stellate-pubescent, slender, spreading, many-branched. *Flowers* very numerous, ·1 in. long, the pedicels slender and rather longer. *Calyx* when expanded rotate, cut half way down into triangular very acute or acuminate spreading teeth, densely stellate-tomentose outside. *Petals* broadly oblanceolate, obtuse, narrowed to the base. *Stamens* 5-delphous. *Staminodes* apparently absent. *Ovary* globose, densely tomentose, not visibly ridged, 5-celled. *Style* filiform, tapering, straight, glabrous. *Fruit* unknown.

Perak, at elevations from 600 to 1000 feet: King's Collector, Nos. 7616 and 7730.

A species distinguished by its slender hoary panicles, with flowers by far more numerous than in any of the other species described here.

7. **PENTACE CURTISII**, n. sp. King. A large tree: the young branches slender, with dark-coloured bark, very minutely adpressed-lepidote, not hairy. *Leaves* ovate elliptic, with a short abrupt blunt acumen, the base rounded: upper surface glabrous, the lower cinereous; basal nerves 2 pairs, one pair slender and close to the margin, the other branching on one side: lateral nerves 2 or 3 pairs; all ascending and rather prominent beneath: length 3·25 to 5·5 in., breadth 2·25 to 2·75 in.; petiole ·75 to 1 in. slender, slightly thickened at apex. *Panicles* mostly terminal (a few smaller axillary) 4·5 to 6 in. long with sparse cinereous stellate tomentum and scales, few-branched, and few-flowered. *Flowers* ·15 in. long, on pedicels shorter than themselves. *Calyx* widely campanulate, stellate-tomentose outside; its teeth as long as the tube, broadly triangular, rather blunt. *Petals* oblanceolate or obovate-obtuse, much narrowed to the base. *Staminodes* lanceolate, acuminate, half as long as the filaments. *Stamens* in 5 bundles. *Ovary* turbinate, with 8 or 9 blunt ridges, lepidote-pubescent: style rather stout, cylindric, shorter than the stamens. *Fruit* ·5 in. long, with 8 semi-elliptic membranous wings ·2 in. broad.

Penang; Curtis, No. 1573.

8. **PENTACE EXIMIA**, n. sp., King. A tree 50 to 70 feet high: young branches slender, dark-coloured, glabrous. *Leaves* ovate-elliptic to ovate-rotund, shortly and abruptly acuminate, the base slightly narrowed or rounded: upper surface glabrous, shining: lower paler and dull; basal nerves 1 pair, bold and reaching to the apex, often with a slender small sub-marginal pair: lateral nerves usually only one pair, short and curving; all rather bold beneath: length 4 to 5·5 in., breadth 2 to 4 in.; petiole ·75 to 1·1 in., thickened at the apex. *Panicles* terminal, 3·5 to 5 in. long, (longer in fruit), minutely scurfy-tomentose, with

rather numerous spreading branches. *Flowers* numerous, ·1 in. long, the pedicels about the same length. *Calyx* densely scaly outside, the teeth triangular. *Petals* cuneate, obtuse, narrowed to a broad claw. *Stamens* about 25, in groups of 5. *Staminodes* lanceolate. *Ovary* subglobular, 10-ridged (the ridges in pairs), scaly and pubescent, 5-celled, the cells with imperfect septa and thus falsely 10-celled. *Styles* 10, much shorter than the stamens, free, or united when young at the base only. *Fruit* about ·5 in. long, with 8 radiating semi-elliptic wings ·1 to ·15 in. broad, minutely adpressed-scaly.

Perak; at elevations under 1000 feet, King's Collector, Nos. 3482 and 3649.

This agrees with *P. Curtisii* in having 8-winged fruit, but the flowers are much smaller. The styles moreover are shorter than the ovary and quite distinct, which is the case in no other species of this genus which I have yet met with.

9. PENTACE SCORTECHINII, n. sp. King. A tree? young branches slender, glabrous, dark-coloured. *Leaves* elliptic-oblong, shortly caudate-acuminate, the base more or less cuneate: both surfaces quite glabrous, concolorous; basal nerves 1 pair very bold, as is the midrib; lateral nerves (from the midrib) 1 or 2 pairs, not conspicuous: length 7 to 9 in., breadth 2·75 to 3·5 in.; petiole less than ·5 in., stout. *Panicles* terminal and axillary, slender, only about half the length of the leaves, few-branched, minutely tomentose. *Flowers* rather crowded, ·25 in. long, on pedicels shorter than the calyx. *Calyx* widely tubular-campanulate, minutely scurfy-tomentose outside, cut a third of its depth into 5 small triangular reflexed teeth. *Petals* obovate, obtuse, much narrowed to the base. *Stamens* in 5 bundles of 15 each. *Staminodes* lanceolate, half as long as the stamens. *Ovary* ovoid, obscurely 5-ridged, scaly, 5-celled. *Style* cylindric, tapering, longer than the stamens. *Fruit* unknown.

Perak, Father Scortechini, No. 119b.

Only once collected and without fruit. A very distinct species.

10. PENTACE GRIFFITHII, n. sp., King. A tree: young branches slender, dark-coloured, glabrous. *Leaves* ovate-elliptic, tapering about equally to the acute apex and base; upper surface shining, lower dull; basal nerves 2 pairs, the lower pair slender and sub-marginal, the upper branched on one side and bold (as is the midrib), ascending, curved; lateral nerves (from the midrib) 2 pairs; length 4 to 7 in., breadth 2·25 to 3 in.; petiole nearly 1·5 in. long, thickened at both ends, but especially at the apex. *Panicles* terminal, slender, few-branched, lax, minutely

cinereous-tomentose. *Flowers* not very numerous, large for the genus (·25 in. long and ·25 in. in diam.), on pedicels about as long as the calyx. *Calyx* widely campanulate, almost rotate, minutely stellate-tomentose outside; the teeth as long as the tube, spreading. *Petals* ovate, obtuse, rather suddenly contracted into a linear claw. *Stamens* in 5 groups of 12 or 13 each. *Staminodes* lanceolate, as long as the filaments. *Ovary* sub-globose, slightly compressed, minutely stellate-tomentose and scaly, obtusely 5-angled, 5-celled. *Style* cylindric, rather shorter than the filaments. *Fruit* nearly 1 in. long, with 10 radiating membranous, horizontal striate, minutely scaly, semi-elliptic, membranous wings, each ·35 in. broad.

Tavoy in Tenasserim; Griffith, Aplin.

A very distinct species only once collected within recent years, by Mr. Aplin. There is, however, in the Kew Herbarium a twig of it collected by Griffith many years ago bearing this note in Griffith's handwriting "*Tiliacearum gen. nov. capsulis pluri-alatis.*" Although this plant has hitherto been found only in territory which is politically Burmese, yet Tavoy (being at the southern extremity of Tenasserim) is practically Malayan in its Flora and Fauna. I therefore include it here.

11. PENTACE STRYCHNOIDEA, n. sp., King. A tree 60 to 80 feet high: young branches slender, cinereous, glabrous. *Leaves* ovate-elliptic rarely ovate-oblong, shortly and abruptly acuminate, the base rounded or slightly narrowed; upper surface shining, glabrous; lower pale and dull; boldly 3-nerved and often with a slender sub-marginal pair of nerves; length 3 to 4 in., breadth 1·75 to 2·25. in.; petiole ·75 in. slightly thickened at the apex. *Panicles* terminal, 3 to 6 in. long, few-branched, lax, minutely lepidote-puberulous. *Flowers* rather large for the genus (·2 in. long). *Calyx* cup-shaped, tomentose outside, cut more than half way down into 5 triangular acute teeth. *Petals* oblanceolate, slightly oblique, much narrowed to the base. *Stamens* in 5 bundles of about 20 each. *Staminodes* linear-lanceolate. *Ovary* ovoid-globose, obtusely 5-ridged, minutely tomentose and lepidote, 5-celled. *Style* filiform, as long as the stamens. *Fruit* unknown.

Perak; at elevations of from 500 to 1000 feet, King's Collector, No. 3478.

3. SCHOUTENIA, Korth.

Trees with alternate simple pinnately-nerved leaves. *Flowers* axillary, solitary or in clusters; or in terminal few-flowered panicles. *Calyx* campanulate, 5-lobed; lobes valvate, accrescent, coloured. *Petals* small, linear without claw, or absent. *Stamens* numerous, free, sometimes inserted on the apex of a short gynophore; anthers oblong, 2-celled: cells parallel, with longitudinal sutural dehiscence. *Staminodes* 0. *Ovary* sessile or shortly stalked, imperfectly 3 to 5-celled; cells with 2 ovules from the base of the axile placentas, style filiform; stigmas 3 to 5, linear fleshy, reflexed. *Capsule* with crustaceous fragile pericarp, dehiscing irregularly, 1-celled (by abortion), 1- to 3-seeded. *Seeds* subglobose, with leathery smooth testa, exalbuminous: the cotyledons large, leafy, thin, crumpled: embryo straight. Distrib. 5 species, of which 4 are Malayan and 1 Cambodian.

Flowers in panicles or solitary, axillary.
  Calyx very accrescent very deeply lobed 1. *S. Mastersii.*
  „ slightly accrescent not deeply lobed 2. *S. Kunstleri.*
Flowers in dense axillary glomeruli ... 3. *S. glomerata.*

1. SCHOUTENIA MASTERSII, King. A tree 60 to 80 feet high: young branches slender, dark-coloured, at first scaly but soon glabrous. *Leaves* thinly coriaceous, ovate-lanceolate, slightly obovate, shortly and bluntly acuminate, the base rounded; upper surface glabrous, the lower minutely and softly tawny-tomentose; nerves slightly prominent beneath, about 3 pairs lateral and 1 pair basal: length ·75 to 3·25 in.; breadth ·4 to 1·1 in.; petiole less than ·1 in. *Flowers* solitary and axillary, or in terminal leafy panicles; the pedicels from ·35 to ·75 in. according to age, tawny-tomentose, jointed below the middle. *Calyx* membranous, pink, conspicuously veined, at first widely campanulate, ·35 in. long, with 5 shallow teeth becoming with the ripening of the fruit, rotate, flat 1·5 to 2 in. in diam., and 5-angled; pubescent outside, glabrous within. *Filaments* very slender, longer than the style. *Ovary* obovoid-globose, tawny-tomentose. *Style* stout, three times as long as the ovary, tomentose: stigmas scaly. *Fruit* depressed-globose, ·3 in. in diam., minutely tomentose. *Chartacalyx accrescens*, Mast. in Hook. fil. Fl. Br. Ind. i. 382.

Malacca, Penang, Perak. Distrib. Borneo.

On this plant the late Dr. Maingay founded his genus *Chartacalyx*. The only points, however, in which it differs from *Schoutenia* (as defined by Bentham and Hooker) are the absence of petals and the presence of a stalk to the ovary on the upper part of which the stamens are inserted; and these appear to me to be, in this order, differences of quite minor importance. Maingay never saw the fruit of this; but copious fruiting specimens have recently been collected and the fruit is found to be exactly that of *Schoutenia*. As regards the structure of the seeds of

Schoutenia, Korthals (the author of the genus) says nothing: nor does Bennet who (Pl. Jav. Rar. p. 239, t. 46) describes at greater length than Korthals the species *S. ovata*, the only one then known. Bennett neither describes nor figures albumen in the seed. Hasskarl (Retzia 1, 136) describes the seeds as exalbuminous, and I find none in the seeds of these species of which I have been able to examine ripe fruit. The only other known species are *S. ovata*, Korth. from Java; and *S. hypoleuca*, Pierre (Fl. Cochin-Chine t. 134) from Cambodia.

2. SCHOUTENIA KUNSTLERI, n. sp., King. A tree 60 to 70 feet high: young branches cinereous, rather rough-glabrous. *Leaves* thinly coriaceous, narrowly obovate-oblong or oblanceolate, acute, the margin slightly waved, slightly narrowed to the rounded 3- to 5-nerved base; upper surface glabrous, shining: lower sub-silvery; the lateral nerves 4 or 5 pairs, spreading, curving, inter-arching near the margin, prominent on the lower surface as are the basal nerves and the numerous slightly curved transverse veins. *Flowers* crowded towards the ends of the branches, in numerous short few-flowered scurfy-tomentose racemes or cymes: pedicels from ·5 to ·75 in. long, jointed and bracteolate above the base, the bracteole oblanceolate. *Calyx* campanulate, membranous, coloured and veined, stellate-hairy on both surfaces, ·5 to ·75 in. long, according to age, cut to the base into 5 ovate spreading lobes. *Petals* 0. *Stamens* on a slightly elevated torus. *Ovary* sessile, sub-globose, densely tomentose, 5-celled. *Style* longer than the stamens. *Stigmas* 5, short, fleshy. *Fruit* 1-celled, 1-seeded, surrounded by the slightly accrescent persistent calyx.

Perak at elevations of from 300 to 800 feet: King's Collector, No 3409: on Ulu Tupa, Wray, No. 2692.

According to the field notes of Messrs. Kunstler and Wray, the calyx is yellow when young, but becomes brown when the fruit ripens.

3. SCHOUTENIA GLOMERATA, n. sp., King. A tree from 40 to 60 feet high: young branches slender, cinereous, minutely pubescent. *Leaves* membranous, glabrous, elliptic-oblong, acute or shortly and bluntly acuminate, the margins slightly waved; the base broad, rounded or emarginate, 3-nerved, the upper pair of nerves very strong, running to the apex of the leaf and joined to the midrib by numerous prominent curving transverse secondary nerves, all very prominent on the pale silvery shining under surface: length 10 to 15 in., breadth 3·5 to 5·5 in.; petiole only ·25 in. long, stout, wrinkled. *Cymes* condensed, very crowded, axillary, 1 to 1·5 in. in diam. *Flowers* ·25 in. long and ·3 in. wide, on tomentose rufous pedicels about ·2 in. long. *Calyx* widely

campanulate, densely rufous-tomentose; teeth 5, broadly triangular, sub-erect. *Petals* 0. *Stamens* numerous; the filaments slender, longer than the calyx. *Ovary* ovoid-globose, densely tawny-tomentose, 5-celled: style longer than the stamens: stigmas short, sub-globose. *Fruit* depressed globose, ·75 in. in diam., sparsely stellate-tomentose, becoming glabrous, covered only at the base by the slightly accrescent calyx.

Johore; on Gunong Panti, King's Collector, No. 159.

4. BERRYA, Roxb.

A tree. *Leaves* alternate, ovate, acuminate, glabrous; base cordate, 5-7-nerved. *Panicles* large, many-flowered, terminal and axillary. *Calyx* campanulate, irregularly 3-5-lobed. *Petals* 5, spathulate. *Stamens* many, inserted on a short torus; anthers didymous, lobes divergent, opening lengthwise. *Staminodes* 0. *Ovary* 3-4-lobed, cells 4-ovuled; style consolidated, stigma lobed; ovules horizontal. *Fruit* loculicidally 3-4-valved, each valve 2-winged. *Seeds* pilose; albumen fleshy; cotyledons flat leafy, radicle superior next the hilum.—Distrib. The following is the only species.

BERRYA AMMONILLA, Roxb. Hort. Beng., 42. A large tree, glabrous except the inflorescence. *Leaves* membranous, broadly ovate, acuminate, the base slightly narrowed and cordate: both surfaces shining, minutely reticulate: basal nerves 2 or 3 pairs, lateral 5 or 6 pairs: length 4 to 8 in., breadth 3 to 5 in.; petiole ·75 to 2·75 in. *Panicles* terminal, or in the upper axils, branching, 6 to 10 in. long, scurfy-pubescent: flowers ·35 in. in diam.; their pedicels slender, ·3 to ·5 in. long. *Petals* longer than the calyx, narrowly oblong, obtuse, glabrous. *Anthers* half as long as the petals. *Ovary* ovoid, truncate, depressed at the origin of the styles, 6 to 8-ridged, pubescent. *Fruit* with 6 radiating, falcate, membranous, striate, deciduously stellate-tomentose wings ·8 in. long. *Seeds* small: 1 to 4 in. each cell, covered with prurient pale brown hairs. Roxb. Fl. Ind. ii. 639; Corom. Plants, ii. t. 264; Wall. Cat. 1068; W. & A. Prodr. i. 81; Wight Ill. t. 34; Thwaites Enum. 32; Beddome Flor. Sylvat. t. 58; Kurz Fl. Burm. i. 155; Hook. fil. Fl. Br. Ind. i. 383.

South Andamans. Distrib. Burmah, Southern Peninsula, India, Ceylon.

5. GREWIA, Linn.

Trees or shrubs more or less stellate-pubescent. *Leaves* entire, 1-9-nerved. *Flowers* axillary and few, or more numerous and panicled. *Sepals* distinct. *Petals* 5, glandular at the base, sometimes 0. *Stamens* many on a raised torus. *Staminodes* 0. *Ovary* 2-4-celled, cells opposite the petals, 2-many-ovuled; style subulate, stigma shortly lobed. *Drupe* fleshy or fibrous, entire, or 2-4-lobed; stones 1-4, 1-2-seeded, with false paritions between the seeds. *Seeds* ascending; albumen fleshy or rarely 0; cotyledons flat. Distrib. About 60 species, chiefly tropical.

- Sect. I. *Grewia* proper. *Flowers* axillary or terminal. *Fruit* fleshy or crustaceous, usually lobed ... ... 1. *G. umbellata.*
- Sect. II. *Microcos. Inflorescence* terminal, in panicled cymes. *Flowers* involucrate. *Drupe* fleshy, entire ... ... 2. *G. paniculata.*
- Sect. III. *Omphacarpus. Inflorescence* terminal, or terminal and axillary. *Flowers* involucrate. *Drupe* with a corky or fibrous rind.
  - Fruit minutely tomentose: mesocarp thick, soft, pulpy, and with many fibres; pyrene single, small.
    - Pyrene membranous: leaves softly tomentose beneath ... ... 3. *G. fibrocarpa.*
    - Pyrene cartilaginous: leaves sparsely stellate-hispid beneath ... ... 4. *G. globulifera.*
  - Fruit glabrous: mesocarp with thin pulp and a few fibres: pyrenes 2 or 3, bony.
    - Leaves sparsely-stellate pubescent beneath: drupe not narrowed into a pseudo-stalk... ... ... 5. *G. latifolia.*
    - Leaves glabrescent or pubescent beneath: drupe narrowed into a long pseudo-stalk... ... ... 6. *G. antidesmæfolia.*
    - Leaves quite glabrous.
      - Basal nerves bold and reaching beyond the middle.
        - Fruit ·5 in. long, furrowed, not compressed ... .. 7. *G. laurifolia.*
        - Fruit 1·4 in. long, not furrowed, compressed ... ... 8. *G. calophylla.*
      - Basal nerves slender, not reaching to the middle: drupe ·75 in. long 9. *G Miqueliana.*

1. **Grewia umbellata**, Roxb. Hort. Beng. 42: Fl. Ind. ii. 591. A shrubby climber 10 to 20 feet long; whole plant except the upper surfaces of the leaves sparsely stellate-puberulous, the bark of the young

branches dark-coloured. *Leaves* oblong-ovate or elliptic, shortly and bluntly acuminate, minutely serrate; base rounded, 3-nerved; upper surface glabrous; the lower pale with the transverse veins prominent and straight: lateral nerves about 3 pairs: length 3 to 4·5 in., breadth 1·5 to 2 in., petiole ·25 in. *Umbels* pedunculate, axillary or terminal, 6 to 8-flowered; the peduncle from ·6 to 1 in. long, with a whorl of small lanceolate glabrous bracteoles at its apex. *Flowers* ·75 in. long when expanded; their pedicels hirsute, unequal, from ·2 to ·5 in. long. *Sepals* ribbed and tomentose outside, glabrous inside, linear-oblong, reflexed. *Petals* much shorter than the sepals, oblong, each springing from the back of a large orbicular claw with hirsute edges. *Torus* long, ridged, tomentose. *Fruit* depressed-globular, obtusely 2- to 4-angled and with 2 to 4 shallow lobes, pericarp sparsely stellate-puberulous; endocarp pulpy; pyrene 2 to 4-celled; its loculi 1-seeded, the endocarp bony. Wight Ic. 83; Wall. Cat. 1084; Mast. in Hook. fil. Fl. Br. Ind. i. 385.

Malacca, Penang, Griffith, Maingay. Perak, King's Collector, Wray.

Roxburgh has left an excellent coloured drawing of this in the library of the Calcutta Herbarium, and there is no doubt about his plant. I cannot agree in identifying with this *G. pedicellata*, Roxb , which that author received from Amboyna: nor do I think that any *Grewia* from the Peninsula of Hindustan is referable to this species

2. GREWIA PANICULATA, Roxb. Fl. Ind. ii. 591. A bushy tree 15 to 30 feet high: young branches scurfy stellate-tomentose, ultimately glabrous, their bark brown. *Leaves* coriaceous, cuneate-obovate to elliptic; the apex blunt, shortly and abruptly acuminate, sometimes 3-lobed and unequal, obscurely serrate-dentate; the base rounded, 3-nerved; upper surface powdered with minute sparse stellate pubescence, the midrib and nerves tomentose: lower surface uniformly stellate-tomentose; the veins transverse, little curved, bold; lateral nerves 4 or 5 pairs, ascending, rather straight, prominent beneath: length 3 to 6 in., breadth 1·5 to 2·75 in.; petiole 25 in., tomentose: stipules glabrescent, lanceolate, often united in pairs, rather shorter than the petioles. *Panicles* 2·25 to 3·5 in. long, terminal or axillary, rusty-tomentose; bracteoles numerous, linear, sometimes bifid: branches spreading. *Flowers* ·25 in. long, the pedicels rather shorter. *Sepals* spreading, concave, obovate narrowed to the base, the edges thin; tomentose on the outer, pilose on the inner, surface. *Petals* shorter than the sepals, oblong, blunt, expanded at the base into a concave claw, hirsute especially outside. *Torus* cup-shaped, short, the lip tomentose. *Ovary* ovoid, stellate-tomentose, 4-celled, each cell with several ovules. *Fruit* ob-

ovoid, recurved, with many curved striae, pericarp membranous, minutely and sparsely stellate-pubescent, the mesocarp fibrous with an outer layer of pulp: pyrene 1-celled, 1-seeded; endocarp stony. Wall. Cat. 1097, partly; Miq. Fl. Ind. Bat. i. pt. 2, 203; Mast. in Hook. fil. Fl. Br. Ind. i. 393. *G. Blumei*, Hassk. Tijdschr. Nat. Gesch. xii. 130; Miq. Fl. Ind. Bat. i. pt. 2, 203. *Microcos tomentosa*, Smith in Rees, Cycl. *G. affinis*, Hassk. Cat. Hort. Bog. 207, not of Lindl.

Singapore; Malacca, Maingay, No. 250. Griffith, No. 634 (Kew Distrib.). Perak. Penang; common.

I retain for this plant the name adopted for it by Masters in Hooker's Flora of British India. But Blume's *G. paniculata* (Bijdr. 115) was published seven years before Roxburgh's. I have not seen any specimen of Blume's plant: but if it be the same as this, then Blume's name must be substituted for that of Roxburgh as the author of the specific name. If Blume's plant, however, be different from Roxburgh's, then some other name must be found for the latter. That the plant above described is what Roxburgh meant to call *G. paniculata*, his coloured drawing in the Calcutta Herbarium leaves no room for doubt.

3. **GREWIA FIBROCARPA**, Mast. in Hook. fil. Fl. Br. Ind. i. 391. A tree 15 to 40 feet high; young branches, under surfaces of leaves, petioles, inflorescence and fruit densely clothed with yellowish-brown stellate tomentum. *Leaves* membranous, ovate-oblong or elliptic, shortly and abruptly acuminate, minutely and obscurely serrulate, the base rounded and boldly 3-nerved; upper surface scaberulous, the midrib and nerves tomentose, under surface softly tomentose; the 5 to 7 pairs of lateral nerves and the transverse veins rather prominent beneath: length 4·5 to 9 in., breadth 1·75 to 4 in., petiole ·25 to ·5 in., stout: stipules deeply and narrowly lobed. *Panicles* terminal and in the upper axils, crowded, ·5 to 2 in. long: involucres lanceolate, curved, tomentose. *Flowers* ·25 in. long, their pedicels much shorter. *Sepals* obovate-elliptic, very tomentose externally, the edges inflexed, sparsely pilose internally. *Petals* minute, sub-orbicular, sometimes absent. *Torus* short, hirsute. *Ovary* ovoid-globose, tomentose; the style short, conical, glabrous. *Fruit* soft, ovoid or obovoid, compressed, 1·25 in. long and ·75 in. in diam., the pericarp membranous and densely tomentose outside, mesocarp fibrous and pulpy; pyrene small, solitary, leathery, 1-celled, 1-seeded. *G. paniculata*, Wall. (Cat. No. 1097 partly) not of Roxb.

Penang; Wallich, Curtis. Malacca; Griffith; Maingay, No. 248, (Kew Distrib.). Perak; Scortechini, King's Collector, Wray. Common.

In the fruit both of this and of *G. globulifera*, the mesocarp forms a thick pulp with many fibres intermixed, and the solitary pyrene is small with a soft coat.

4. GREWIA GLOBULIFERA, Mast. in Hook. fil. Fl. Br. Ind. i. 391. A small shrubby tree; young branches densely covered with short yellowish-brown tomentum. *Leaves* thinly coriaceous, broadly elliptic, sometimes slightly obovate and unequal-sided, shortly and abruptly acuminate, entire, the base rounded, boldly 3-nerved: upper surface scaberulous, glabrous except the minutely tomentose midrib and nerves: under surface shortly and sparsely stellate-hispid: main nerves 7 to 8 pairs, spreading, prominent beneath, the transverse nerves rather thin, the reticulations minute but distinct: length 4·5 to 10 in., breadth 3 to 6 in.; petiole ·4 to ·75 in., tomentose. *Panicles* often on long peduncles, axillary and terminal, narrow, few-flowered, covered with soft yellowish stellate tomentum: length 2·5 to 4·5 in. (of which the peduncle may be more than half). *Flowers* ·35 in. long, their pedicels much shorter. *Sepals* oblong, spreading, curved inwards, tomentose on both surfaces, the edges much incurved. *Petals* much shorter than the sepals, glabrous, linear-lanceolate, without any distinct claw but sometimes more or less thickened and hairy at the base. *Torus* a very shallow cup with hirsute edge. *Ovary* ovoid, pointed, tomentose; style as long as the ovary, cylindric, glabrous. *Fruit* usually solitary at the apex of a branch of the panicle, sub-obovoid, compressed, 1·25 in. long and ·65 in. in diam.; pericarp membranous minutely tomentose, the mesocarp pulpy and very fibrous; the single pyrene much smaller, endocarp cartilaginous, 1-celled, 1-seeded.

Malacca; Griffith, No. 635; Maingay, No. 245, (Kew Distrib.); Harvey. Perak; Scortechini, King's Collector, Wray: at low elevations.

In its fruit this much resembles *G. fibrocarpa*. The drupe, however, of this is obovoid not ovoid, and the stone is larger with cartilaginous not membranous endocarp. The leaves also differ in being sparsely shortly hispid-pubescent instead of softly tomentose. A near ally of this species is also *G. latifolia*, Mast. from which this differs in its petals having no distinct claw, whereas in those of *G. latifolia* the claw is larger than the limb. This also differs in the shape of its ovary and style, and in the very different appearance of its drupe.

5. GREWIA LATIFOLIA, Mast. in Hook. fil. Fl. Br. Ind. i. 392. A shrubby tree 20 to 40 feet high: young branches rather stout, minutely but harshly tawny-or cinereous-tomentose. *Leaves* coriaceous, drying a dark brown, broadly elliptic, shortly and abruptly sub-acuminate,

entire, slightly narrowed to the rounded 3-nerved base: upper surface glabrescent, the midrib sub-tomentose, lower surface rather sparsely rusty stellate-pubescent: main lateral nerves 5 to 8 pairs, prominent beneath as are the rather straight transverse veins: length 6 to 9 in., breadth 3·5 to 4·5 in.; petiole ·5 to ·75 in. stout, tomentose. *Panicles* short, axillary or terminal, rusty-tomentose 1·5 to 2·5 in. long and 1 in. or more broad, few-flowered: involucres ovate-lanceolate. *Flowers* 2·5 in. long, their pedicels shorter. *Sepals* oblong, tomentose on both surfaces. *Petals* shorter than the sepals, oblong, acute, the hirsute claw larger than the glabrescent limb. *Torus* cup-shaped, with hirsute margin. *Ovary* depressed-globose: style cylindric, puberulous. *Drupe* obovoid, ·75 in. long and ·5 in. in diam., pericarp at first sparsely pubescent, afterwards glabrous, mesocarp fibrous and pulpy: pyrene single, 1-celled, 1-seeded: endocarp bony.

Malacca; Griffith, (Kew Distrib.) 638/1; Maingay. Perak; King's Collector, Scortechini, Wray.

6. Grewia antidesmæfolia, n. sp., King. A tree usually 30 to 40, but sometimes 50 to 60 feet, high: young branches glabrous, their bark cinereous. *Leaves* membranous, glabrescent when young, when old quite glabrous, elliptic-oblong, acute or shortly acuminate, entire, the base usually cuneate but sometimes rounded, boldly 3-nerved; lateral main nerves 5 or 6 pairs, little curved, ascending, prominent beneath; length 4·5 to 8 in., breadth 1·5 to 2·75 in.; petiole ·4 to ·6 in. slender. *Panicles* pedunculate, axillary and terminal, slender, the branches short, spreading, few-flowered, densely but minutely cinereous, velvetty, 2 to 3 in. long. *Flowers* ·25 in. long, their pedicels shorter. *Sepals* elliptic, slightly obovate, their edges in the upper half much incurved, tomentose outside, pubescent inside. *Petals* much shorter than the sepals, oblong, blunt, the glabrescent limb about as long as the broad thickened claw; claw pilose behind, with hirsute edges in front. *Torus* cylindric, glabrous, with wide wavy hirsute mouth. *Ovary* ovoid-globose, pilose when young, glabrescent when adult, shorter than the cylindric glabrous style. *Fruit* pyriform, obtusely 3-angled, narrowed to a long pseudo-stalk, ·75 in. long (including the narrowed portion) about ·35 in. in diam.; pericarp glabrous, mesocarp slightly fleshy with a thin fibrous inner layer. *Pyrenes* 3, with bony endocarp, two of them abortive and the third 1-celled, 1-seeded.

Perak: at low elevations; common, Scortechini, King's Collector, Wray.

Var. *hirsuta;* young branches, lower surfaces of leaves, and ovary pubescent to tomentose.

Perak; King's Collector.

7. GREWIA LAURIFOLIA, Hook. in Hook. fil. Fl. Br. Ind. i. 392. A tree 20 to 30 feet high; all parts except the inflorescence glabrous: young branches with dark-coloured bark. *Leaves* thinly coriaceous, oblong-lanceolate or lanceolate, acuminate or acute, entire; the base rounded boldly 3-nerved: both surfaces shining; lateral nerves 1 or 2 pairs, alternate; length 4 to 6 in., breadth 1·5 to 2·5 in., petiole ·5 to ·7 in. *Panicles* terminal and axillary, 1·5 to 4 in. long, lax, few-flowered, puberulous: bracteoles few, linear, fugaceous. *Flowers* ·2 in. long, their pedicels about ·15 in. *Sepals* ovate, concave, the edges much inflexed, minutely tomentose on both surfaces. *Petals* much shorter than the sepals, oblong, often absent. *Torus* cup-shaped, its rim hirsute. *Ovary* globose, sub-glabrous, 4-celled. *Style* thick, cylindric, tapering, glabrous. *Drupe* ovoid, ·5 in. long, the pedicel about as long, with 1 or 2 vertical furrows, pericarp glabrous, endocarp fleshy and fibrous: pyrene 1 to 3-celled, but usually only one cell containing a single seed: endocarp bony.

Malacca; Griffith, Maingay. Penang; Curtis. Perak; Scortechini, King's Collector. Distrib. Sumatra.

8. GREWIA CALOPHYLLA, Kurz Andam. Rep. App. B. iii; Flor. Burm. i. 157. A tree 20 to 30 feet high: all parts glabrous except the minutely velvetty tawny inflorescence: young branches slender, dark-coloured. *Leaves* thinly coriaceous, shining, ovate-lanceolate to ovate-elliptic, acuminate, entire; the base rounded or slightly cuneate, 3-nerved; lateral nerves 3 or 4 pairs, ascending; transverse nerves slender: length 4 to 7 in., breadth 1·75 to 3 in., petiole ·3 to ·75 in. *Panicles* pedunculate, axillary or terminal, few-flowered, 1·5 to 3 in. long. *Flowers* ·5 in. long, their pedicels very short. *Sepals* narrowly oblong, the edges much incurved, minutely velvetty, much reflexed. *Petals* about half the length of the sepals and much narrower, lanceolate; the limb subulate; the claw ovoid, expanded, thick and densely tomentose at the margin. *Torus* cylindric, puberulous outside. *Ovary* ovoid, pointed, style long filiform, both puberulous. *Fruit* obovoid, compressed, 1·4 in. long and ·75 in. in diam.; pericarp membranous, glabrous, shining; mesocarp thick, pulpy and fibrous: pyrenes 3, of which one is 2-celled but contains only a single seed, the others abortive; the endocarp bony. Mast. in Hook. fil. Fl. Br. Ind. i. 392.

Nicobar Islands, Kurz: S. Andaman, Kurz, King.

This is very near *G. laurifolia*, Hook. but has very much larger fruit. A Malacca plant (Griffith, No. 630/2 Kew Distrib.) resembles this in leaves but not in flower. The only specimens which I have seen are too imperfect for determination.

9. Grewia Miqueliana, Kurz, in Flora for 1872, p. 398. A tree 20 to 40 feet high: young branches at first very sparsely and minutely lepidote, afterwards glabrous, the bark dark brown. *Leaves* thinly coriaceous, glabrous, shining, ovate-lanceolate to lanceolate, shortly acuminate, entire, the base cuneate, faintly 3-nerved; both surfaces glabrescent soon becoming glabrous: main lateral nerves 5 or 6 pairs, not prominent; length 3 to 5 in., breadth 1 to 1·75 in.; petiole ·2 to ·3 in., scaly-tomentose; stipules oblong, blunt, oblique. *Panicles* axillary and terminal, lax, few-flowered, sparsely lepidote and puberulous, 1 to 2 in. long. *Flowers* ·3 in. long, their pedicels very short. *Sepals* oblanceolate, acute, the edges inflexed, minutely tomentose. *Petals* much shorter than the sepals, the glabrescent linear acute limb shorter and narrower than the thickened rounded tomentose claw. *Torus* short, cylindric, puberulous with villous edges. *Ovary* globose-ovoid, tomentose, shorter than the cylindric glabrous style, 2-celled. *Drupe* pyriform, ·75 in. long and ·5 in. in diam., glabrous: pericarp smooth, glabrous, shining; mesocarp fibrous with a little pulp: pyrenes 2, each 1-celled, one 1-seeded, the other barren: the endocarp bony. *Inodaphnis lanceolata*, Miq. Fl. Ind. Bat. Suppl. 357; Ann. Mus. Lugd. Bat. iii. 89; Meisn. in DC. Prod. xv. 1, 265.

Malacca; Maingay, (Kew Distrib.) No. 244. Perak; Scortechini, King's Collector, at low elevations. Dindings; Curtis, No. 1613. Distrib. Sumatra.

There is an authentic fruiting specimen in the Calcutta Herbarium of Miquel's *Inodaphnis lanceolata* collected in Sumatra. And there is no doubt whatever that Kurz was right in referring the plant to *Grewia*. Miquel founded his genus on specimens without flowers; and, apparently from the structure of the fruit, he suggested its affinity to *Inocarpus*. Later on he suggested (Ann. Mus. Lugd. Bat. iii. 89) its affinity with the Rosaceous genera *Chrysobalanus*, *Parastemon* and *Diemenia* (= *Trichocarya*). Meissner in DC. Prod. (l. c.) briefly described the genus at the end of *Hernandiaceae*, but without indicating his opinion as to its proper place. Had these distinguished botanists had an opportunity of examining flowers, they would doubtless have referred it without hesitation to *Grewia*. The practice (fortunately confined to a few authors) of founding genera on specimens without flowers cannot be too strongly condemned.

6. Triumfetta, Linn.

Herbs or undershrubs, generally more or less covered with stellate hairs. *Leaves* serrate or dentate, simple or lobed. *Flowers* yellowish, in dense cymes. *Sepals* 5, oblong, concave. *Petals* 5. *Stamens* 5-35, springing from a fleshy, lobed, glandular torus. *Ovary* 2-5-celled, cells 2-ovuled; style filiform, stigma 5-toothed. *Fruit* globose or oblong, spiny or bristly, indehiscent or 3-6-valved. *Seeds* 1-2 in each cell, pendulous, albuminous embryo straight, cotyledons flat. Distrib. A genus of about 40 very variable species, mostly tropical weeds.

Fruit tomentose, bristles shorter than itself ... 1. *T. rhomboidea.*
„ villous „ longer „ ... 2. *T. pilosa.*
„ glabrous „ „ „ ... 3. *T. annua.*

1. TRIUMFETTA RHOMBOIDEA, Jacq. DC. Prod. i. 507. Erect, herbaceous or shrubby, annual, glabrous or pubescent. *Leaves* polymorphous, but usually rhomboid, 3-lobed, coarsely and unequally serrate, the upper more or less lanceolate; length 1·75 to 3 in., breadth nearly as much in the rhomboid, much less in the lanceolate forms; petioles ·25 to 1·25 in. *Peduncles* short, 4 to 6-flowered. *Flowers* about ·15 in. long, the buds clavate. *Sepals* apiculate: petals oblong, ciliate at the base. *Stamens* 8 to 15. *Fruit* about ·2 in. in diam., globose, tomentose, covered with short glabrous or pubescent hooked spines. Masters in Hook. fil. Fl. Br. Ind. i. 395. *T. angulata*, Lam. Dict. iii. 41; Wight Ic. t. 320; W. & A. Prodr. i. 74; Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25; Wall. Cat. 1075, 2, C; Miq. Fl. Ind. Bat. pt. i. 197. *T. angulata, β. acuminata*, Wall. Cat. 1075 *β*. *T. Bartramia*, Roxb. Fl. Ind. ii. 463; Wall. Cat. 1075, D, E. *T. trilocularis*, Roxb. Fl. Ind. ii. 462; Wall. Cat. 1083. *T. vestita*, Wall. Cat. 1078, in part.

In all the provinces: a weed. Distrib. British India, Ceylon, Malacca, Archipelago, China, Africa.

2. TRIUMFETTA PILOSA, Roth Nov. Sp., 233. Erect, herbaceous or shrubby, annual; the whole plant, but especially the young branches and the under surface of the leaves, villous, stellate-tomentose. *Leaves*; the lower broadly ovate, sometimes 3-lobed; the upper ovate to ovate-lanceolate, acute or acuminate, unequally and rather coarsely serrate or dentate; length 2 to 4·5 in., breadth 1 to 1·75 in; petiole ·5 to 1 in. *Stipules* linear-subulate. *Peduncles* many-flowered, usually shorter than the petiole. *Calyx* ·25 in. long, sparsely hairy. *Petals* spathulate-oblong, nearly as long as the calyx. *Fruit* globular, about ·25 in. in diam., villous, densely covered with spines longer than itself which are hispid below, glabrous above, and usually hooked at the apex. W. & A. Prodr. i. 74; Hook. fil. Fl. Br. Ind. i. 394. *T. pilosa*, var. *β*, Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25. *T. tomentosa*, Wall. Cat. 1078 C. *T. glandulosa*, Heyne Herb.; Wall. Cat. 1077, 5. *T. polycarpa*, Wall. Cat. 1079. *T. oblongata*, Link Enum. Pl. Hort. Ber. ii. 5; Wall.

Cat. 1077, 1, 2, 3. *T. ovata*, DC. Prodr. i. 507? *T. pilosa*, Wall. Cat. 1080. *T. pilosa*, var. *a*, Thwaites Enum. 31. *T. vestita*, Wall. Cat. 1078, 1, 2. *T. indica*, Ham. in Wall. Cat. 237, 1078 D; W. & A. Prodr. i. 74. *T. oblonga*, Wall. in Don. Prodr. 227.

Malacca, Singapore: Perak, King's Collector, No. 989; and probably in all the provinces. Distrib. British India, Ceylon, Africa.

A common and rather variable weed. The bristles of the fruit are usually hooked at the apex; but in some specimens they are quite straight. The species *T. tomentosa*, was founded by Bojer on specimens collected in Mombassa, having straight fruit-bristles and the lower leaves broadly oval or oblong and often 3-lobed. Many of the Indian forms have been referred to that, but I think they might very well be included in *T. pilosa*, and in the synonymy above quoted I have adopted this view.

3. TRIUMFETTA ANNUA, Linn. Mant. p. 73. Annual, shrubby, erect, 1 to 2 feet high; the whole plant with sparse pale straight hairs, the older parts glabrescent. *Leaves* thin, ovate-acuminate, coarsely dentate, 3-nerved, 3 to 5 in. long, by 1·5 to 2 broad: petioles nearly 1·5 in. *Stipules* subulate, minute. *Peduncles* axillary, 3-flowered. *Calyx* ·25 in. long, nearly glabrous. *Petals* shorter than calyx. *Stamens* 10. *Fruit* globose, pitted, glabrous, ·2 in. across, bearing numerous smooth glabrous thin hooked spines longer than the capsule. DC. Prod. i. 507; Miq. Fl. Ind. Bat. i. pt. 2, 196; Hook. fil. Fl. Br. Ind. i. 396. *T. polycarpa*, Wall. Cat. 1079, partly. *T. trichoclada*, Link. ex DC. Prodr. i. 507; Wall. Cat. 1082. *T. indica*, Lam. Dict. iii. 420?

Perak: a weed. Distrib. British India, Malay Archipelago, Africa.

7. CORCHORUS, Linn.

Herbs or undershrubs, more or less covered with stellate pubescence, or glabrescent. *Leaves* simple. *Peduncles* axillary or opposite to the leaves, 1-2-flowered. *Flowers* small, yellow. *Sepals* 4-5. *Petals* 4-5, glandless. *Stamens* free, indefinite or rarely twice the number of the petals, springing from a short torus. *Ovary* 2-6-celled, style short, stigma cup-shaped. *Capsule* elongated, slender or subglobose, smooth or prickly, loculicidally 2-5-valved, sometimes with transverse partitions. *Seeds* numerous, albuminous, pendulous or horizontal; embryo curved. Distrib. 35 species, throughout the tropics.

Capsules globular ... ... 1. *C. capsularis.*
,, cylindric, 10-ridged ... ... 2. *C. olitorius.*
,, ,, 6-winged ... ... 3. *C. acutangulus.*

1. CORCHORUS CAPSULARIS, L. sp. 746. Annual, shrubby, glabrescent. *Leaves* lanceolate or oblong-lanceolate, acuminate, coarsely serrate, the base rounded and with 2 subulate appendages: length 2 to 4 in., breadth ·75 to 1·5 in., petiole ·5 in. or less; stipules linear-subulate ·25 to ·5 in. *Capsules* axillary, truncate-globose, ridged, wrinkled, sub-muricate, 5-celled. *Seeds* few in each cell. DC. Prodr. i. 505; Roxb. Fl. Ind. ii. 581; W. & A. Prodr. i. 73; Wall. Cat. 1071 A, B, C; Wight. Ic. t. 311; Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25; Miq. Fl. Ind. Bat. i. pt. 2, 194; Hook. fil. Fl. Br. Ind. i. 397. *C. Marua*, Ham. in Wall. Cat. 6311.—Rumph. Amb. v. t. 78, f. 1.

Cultivated here and there in all the provinces for its fibre which is known in commerce as "Jute." Doubtfully wild.

2. CORCHORUS OLITORIUS, L. sp. 746. Annual, shrubby, glabrescent. *Leaves* ovate-lanceolate, serrate, the base rounded and with 2 subulate appendages: length 2 to 4 in., breadth ·75 to 2 in., petiole ·75 to 1·5 in.,; stipules linear, ·5 to 1 in. *Capsules* cylindric, 10 ribbed, 5-celled, 2 in. long. DC. Prod. i. 504; Roxb. Fl. Ind. ii. 581; W. & A. Prod. i. 73; Wall. Cat. 1072; 1, 2, 3, 4, D, E, F; Boiss. Fl. Orient. i. 845; Dalz. & Gibs. Bomb. Fl. 25; Miq. Fl. Ind. Bat. i. pt. 2, 195; Thwaites Enum. 31; Hook. fil. Fl. Br. Ind. i. 397. *C. decemangularis*, Roxb. Fl. Ind. ii. 582; Wall. Cat. p. 237, 1072 G.

Doubtfully wild: but occasionally cultivated in all the provinces under the name of "Jute."

3. CORCHORUS ACUTANGULUS, Lamk. Dict. ii. 104. Erect, herbaceous, the stems with a broad line of pubescence interrupted and varying in position at the nodes, otherwise glabrous. *Leaves* ovate to ovate-lanceolate, acute or acuminate, serrate, the base rounded, with or without subulate appendages, sparsely hairy on both surfaces; length 1·5 to 2 in., breadth ·75 to 1·75 in.; petiole ·25 to ·75 in. slender, villous at the apex: stipules lanceolate, acuminate, ·5 in. long. *Capsules* 1 to 1·5 in. long, cylindric, 6-winged, with 3 terminal bifid beaks, 3-celled. DC. Prod. i. 505; W. & A. Prodr. i. 73; Wall. Cat. 1069, 1074 D, E; Wight Ic. t. 739; Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25; Miq. Fl. Ind. Bat. i. pt. 2, 194; Hook. fil. Fl. Br. Ind. i. 398. *C. æstuans?* Ham in Wall. Cat. p. 237, 1074 C. *C. fuscus*, Roxb. Hort. Beng. 42; Fl. Ind. ii. 582; Ham. in Wall. Cat. 1069.

Johore: at the base of Gunong Panti, King's Collector, No. 180. Distrib. India, Ceylon, Australia, Africa, W. Indies.

8. TRICHOSPERMUM, Blume.

Trees with penni-nerved, minutely stellate, puberulous leaves.

Flowers in axillary or terminal, umbellate, stalked cymes or panicles. *Sepals* 5 valvate, thick. *Petals* 5, membranous with a scale at the base. *Stamens* numerous, free, inserted on the inner surface of an annular marginally villous sub-crenate disk; anthers broad, short, versatile, the connective sub-orbicular. *Ovary* sessile, 2-celled, with numerous ovules on axile placentas: style short, stigma expanded, papillose. *Capsule* orbicular-reniform, much compressed at right angles to the dissepiments, loculicidally 2-valved, many-seeded. *Seeds* sub-lenticular, with a thin imperfect marginally villous arillus; albumen fleshy; embryo central the cotyledons orbicular, foliaceous; radicle straight. Distrib. 3 species 2 of which are Malayan and Polynesian.

1. TRICHOSPERMUM KURZII, King. A tree 40 to 60 feet high: bark of young branches very dark-coloured, sparsely and minutely stellate-pubescent when young, speedily glabrous. *Leaves* membranous, ovate-elliptic, shortly acuminate, minutely serrate-crenate especially near the apex; the base rounded, sub-truncate, sub-cordate, boldly 3-nerved: lateral nerves about 4 pairs: the transverse veins sub-horizontal, curved, bold: length 4 to 6 in., breadth 2 to 3 in., petiole about ·5 in. *Panicles* solitary, axillary or terminal, stalked, cymose, 2-3-chotomous, much shorter than the leaves when in flower, nearly as long when in fruit, stellate-tomentose. *Sepals* oblong, acute, stellate-tomentose outside, glabrous inside except a tuft of hairs at the base. *Petals* about the size and shape of the sepals, glabrescent, with a fleshy scale at the base and a transverse belt of long hairs above it. *Ovary* sessile, densely villous; style shorter than the ovary, cylindric, expanding upwards into the broad papillose stigma. *Capsule* about ·75 in. long and slightly wider, emarginate at the apex and crowned by the persistent style: pericarp leathery, villous and dark-coloured; inside white, shining and glabrous: placentas broad, seeds sessile or shortly stalked, sub-lenticular, the long hairs of the arillus forming a marginal ring. *Bixagrewia nicobarica*, Kurz, Trim. Journ. Bot. for 1875, p. 325, t. 169.

Nicobars: Kurz. Perak; King's Collector, Wray.

The genus *Trichospermum* was founded by Blume for his single species *T. Javanicum.* The generic definition which I have given above differs from that of Blume (Bijdr. 56), in these respects. Blume describes (1) the æstivation of the sepals as imbricate; (2) the style as absent; (3) the stigmas as two and emarginate. The definition also differs from that given by Benth. & Hook. (G. P. i. 236) inasmuch as these authors describe (1) the petals as naked at the base; (2) anthers oblong; (3) style almost none; (4) stigma sessile, retuse; (5) the apex of the capsule produced into a short thick leathery expansion; (6) leaves entire.

9. ELÆOCARPUS, Linn.

Trees. *Leaves* simple. *Flowers* usually hermaphrodite, rarely polygamous, in axillary racemes. *Sepals* 5, distinct. *Petals* 5, usually laciniate at the apex, rarely entire, springing from the outside of a cushion-shaped, often 5-lobed torus. *Stamens* usually indefinite, never less than 10, arising from the inside of the torus, and more or less aggregated into groups opposite the petals and alternating with the glands of the torus; anthers innate, linear, opening by a terminal pore. *Ovary* sessile, 2-5-celled, cells 2-many-ovuled; style columnar. *Drupe* with a single bony stone which is 3-5 or, by abortion, 1-celled. *Seeds* pendulous, 1 in each cell, albumen fleshy; cotyledons flat. Distrib. About 50 species chiefly in the Indian Archipelago and India; a few in some of the South Sea Islands, New Zealand, and Australia.

Sect. I. *Ganitrus.* *Ovary* and *drupe* 5-celled, the latter globular.
Leaves glabescent or glabrous, without stipules.
Leaves lanceolate ... ... 1. *E. Ganitrus.*
,, ovate-oblong ... ... 2. *E. parvifolius.*
Leaves softly rusty-pubescent or tomentose beneath, stipulate ... ... 3. *E. stipularis.*
Sect. II. *Eu-elæocarpus.* *Ovary* 3-celled: longer cell of anthers usually with an apical tuft of minute hair; petals cunei form, fimbriate.
Leaves pubescent beneath, elliptic-oblong ... ... 4. *E. Scortechinii.*
Leaves glabrescent beneath; the midrib pubescent.
Leaves ovate to elliptic-ovate, with black dots beneath ... 5. *E. Wrayi.*
,, narrowly lanceolate, not dotted beneath... ... 6. *E. salicifolius.*
Leaves quite glabrous everywhere.
Leaves with rounded bases.
Petals glabrous ... ... 7. *E. robustus.*
,, glandular-pubescent ... 8. *E. nitidus*, var. *leptostachyus.*
Leaves with their bases much narrowed.
Petals glandular-pubescent: fruit ovoid or slightly obovoid, blunt ... ... 8. *E. nitidus.*

Petals glabrous except on the edges: fruit ovoid-elliptic, slightly apiculate ... 9. *E. floribundus.*

Sect. III. *Monocera.* Outer cell of anther produced into an awn. *Ovary* 2-celled. *Drupe* 1-celled, 1-seeded.

Petals ovate-acuminate, entire ... 10. *E. paniculatus.*

Petals about equally wide at base and apex; the apex toothed ... ... 11. *E. petiolatus.*

Petals wider at the base than the apex, the edges much incurved below the middle, the apex irregularly toothed or fimbriate.

Apex of leaves acuminate.

Racemes longer than the leaves: stamens 35 to 40 ... 12. *E. Griffithii.*

Racemes usually shorter than the leaves: stamens 20 ... 13. *E. Hullettii.*

Apex of leaves obtuse: stamens about 15 ... ... 14. *E. pedunculatus.*

Petals oblong, slightly obovate, apex obtuse with 6 to 8 broad teeth ... 15. *E. Kunstleri.*

Petals cuneiform.

Apex of petals with 8 to 10 rather broad teeth, sometimes 2-lobed: stamens 30 to 50 ... ... 16. *E. obtusus.*

Petals oblong-cuneiform to cuneiform, with numerous fimbriae ... 17. *E. apiculatus.*

Petals broadly cuneiform, lobed and fimbriate ... ... 18. *E. aristatus.*

Sect. IV. *Acronodia.* Flowers 4-merous, polygamous; anthers not awned and usually not bearded (sometimes slightly bearded in *E. glabrescens*).

Leaves sparsely and minutely pubescent or puberulous beneath, their edges serrulate; petals elliptic, the apex slightly lobed ... ... 19. *E. polystachyus.*

Leaves rufous-tomentose beneath, subglabrescent only when very old, edges quite entire, recurved; petals oblong, obtuse, 8 to 10-toothed ... 20. *E. Jackianus.*

Leaves rufous-pubescent on lower surface when young: ultimately glabrescent or glabrous ... ... 21. *E. glabrescens.*
Leaves glabrous at all stages.
  Leaves acute narrowed at the base into the petiole: fruit oblong-ovoid, ·5 in. long ... ... 22. *E. punctatus.*
  Leaves acuminate (often caudate) base not passing into petiole: fruit ovoid-globose, ·35 in. long... 23. *E. Mastersii.*

1. Elæocarpus Ganitrus, Roxb. Hort. Beng. 42: Fl. Ind. iii. 592. A tree 30 to 60 feet high: branchlets with dark bark, cinereously puberulous when quite young. *Leaves* membranous, lanceolate, acute at base and apex, obscurely serrulate, glabrescent or glabrous: main nerves 10 to 12 pairs, spreading, slender: length 3·5 to 5·5 in., breadth 1·25 to 2·25 in., petiole ·3 to ·5 in. *Racemes* from the branches below the leaves, drooping, shorter than the leaves, crowded, many-flowered. *Flowers* ·35 in. long, narrow and pointed in bud; their pedicels rather longer, puberulous. *Sepals* lanceolate, shorter than the petals, puberulous outside, glabrescent inside. *Petals* obovoid, the base thickened, rounded and puberulous at the edge; the limb glabrous, laciniate for more than half its length. *Torus* short, fleshy, wrinkled, pubescent. *Anthers* about 30 to 35, sessile, slightly pubescent or glabrous; the cells slightly unequal, the longer with 1 (or sometimes 2) short white terminal hairs. *Ovary* ovoid-conic, with deep vertical grooves, minutely tomentose, 5-celled, each cell with about 4 ovules. *Style* much longer than the ovary, thin, fluted, puberulous or glabrescent, thickened towards the base. *Fruit* spherical, ·75 to ·9 in. in diam., glabrous, bluish-purple; the stone vertically 5-grooved, tubercled, 5-celled, often only one cell containing a ripe seed. Mast. in Hook. fil. Fl. Br. Ind. i. 400; Kurz Fl. Burm. i. 13; Wall. Cat. 2660 A to D; Dalz. & Gibs. Bomb. Fl. 27. *Ganitrus sphærica*, Gærtn. Fruct. ii. 271, t. 139, f. 6; Wight Ic. i. 66.—Rumph. Amb. iii. t. 101. *E. cyanocarpa*, Maing. in Hook. fil. Fl. Br. Ind. i. 406.

Malacca; Maingay, No. 263. Penang; Curtis. Perak; King's Collector, Scortechini. Distrib. Java; British India, in damp tropical forests as far west as Nepal.

I have dissected flowers of the type specimen (Maingay No. 263) of *E. cyanocarpa*, Maingay, and I can find no difference in them from those of the type sheets of *E. Ganitrus* in Wall. Cat. Roxburgh's original drawing of *E. Ganitrus* in Herb. Calc. is wrong as regards the petals, which it represents as too broad and with too many fimbriæ: otherwise it is an equally exact representation of the Indian plant described by him as *E. Ganitrus*, and of *E. cyanocarpa*, Maingay.

2. ELÆOCARPUS PARVIFOLIUS, Wall. Cat, 2662 A & B. A tree 30 to 50 feet high; young branches at first minutely pubescent, ultimately glabrous greyish-brown and minutely lenticellate. *Leaves* membranous, ovate-oblong, rather bluntly acuminate, serrulate, the base cuneate: upper surface shining, glabrous; the lower dull of chocolate brown colour, glabrous or glabrescent, the midrib and 5 or 6 pairs of curved ascending nerves pubescent on both; length 2·5 to 4 in., breadth 1·1 to 1·4 in.; petiole ·6 to ·75 in., slender, puberulous. *Racemes* from the branches below the leaves, rather shorter than the leaves, the rachis, flower-pedicels and outside of calyx softly and shortly pubescent. *Flowers* ·3 in. in diam., their pedicels about ·1 in., recurved, buds conical. *Sepals* slightly shorter than the petals, lanceolate, puberulous within and 3-nerved. *Petals* cuneiform, slightly nerved, cut half-way down into numerous narrow laciniæ, almost glabrous. *Torus* of 5 distinct, broad, shallow, fleshy, grooved, pale, velvety glands. *Stamens* 15, shorter than the petals, with short filaments; the anthers scaberulous, cells equal, obtuse, the outer sometimes with 2 or 3 minute pale apical hairs. *Ovary* globose, 5-grooved, 5-celled, sparsely pubescent. *Style* as long as the stamens, cylindric, faintly 5-grooved, glabrescent or glabrous. *Fruit* globose, sometimes ovoid-globose, ·75 to 1 in. in diam.: stone 5-celled, with fertile seeds in only 2 or 3 cells, ovoid, ·7 in. long, bluntly rugose, and with 5 very faint grooves from base to apex. C. Mull. Annot. de fam. Elæocarp. 24; Hook. fil. Fl. Br. Ind. i. 401.

Singapore; Ridley, King's Collector. Malacca; Griffith, (Kew Distrib.) 684, Maingay, 254. Penang and Singapore; Wallich, Curtis. Perak; King's Collector, Scortechini.

3. ELÆOCARPUS STIPULARIS, Blume Bijdr. 121. A more or less rusty-pubescent tree 40 to 70 feet high: young branches thin, minutely tomentose. *Leaves* coriaceous, ovate to oblong-ovate, acute or acuminate: the edges usually entire, slightly recurved when dry, sometimes waved; the base slightly cuneate, or sometimes rounded: upper surface at first puberulous, ultimately glabrous, the midrib always pubescent: lower softly rusty-pubescent: main nerves 9 to 12 pairs, spreading, interarching close to the margin: length 3·6 to 6·5 in., breadth 1·75 to 2·5 in.; petiole ·5 to ·75 in., minutely tomentose, not conspicuously thickened at the apex; stipules halbert-shaped, tomentose, fugaceous. *Racemes* axillary and from the axils of fallen leaves, usually shorter than, but sometimes as long as the leaves; the rachises, pedicels

and outside of sepals minutely tomentose. *Flowers* ·35 in. in diam., their pedicels ·2 to ·3 in. long; buds sub-globose, obtusely pointed. *Sepals* ovate-lanceolate, pubescent inside especially towards the base, the midrib thickened. *Petals* longer than the sepals, cuneiform, lobed and cut irregularly half-way into about 25 slightly unequal fimbriae, veined, glabrous, the edges villous. *Torus* of 5 distinct, fleshy, sub-globose, puberulous, transversely oblong, truncate, 2-grooved glands. *Stamens* 25, about half as long as the petals: filaments about half the length of the scaberulous anthers; cells unequal, the longer with (but sometimes without) an apical tuft of 4 or 5 stiff white hairs. *Ovary* ovoid-globose, vertically 5-furrowed, tomentose, 5-celled. *Style* twice as long as the ovary, conic-cylindric, pubescent at the thickened base, glabrescent above. *Fruit* globose, smooth; ·8 to 1 in. in diam.; pulp thin: stone very hard, thick, 1-seeded. Miq. Fl. Ind. Bat, i. pt. 2, p. 209; Mast. in Hook. fil. Fl. Br. Ind. i. 404; Kurz Fl. Burm. i. 170.

Malacca; Griffith, No. 683, Maingay, No. 255, (Kew Distrib.). Singapore, Malacca, Penang, Perak; very common at low elevations. Distrib. Java, Sumatra, Borneo, Burmah.

Var. *latifolia*, King. *Leaves* broadly elliptic to elliptic-oblong 5 to 7 in. long and 2·75 to 3·75 in. broad: petioles elongate, 1·5 to 2·75 in.; stipules lanceolate.

Perak; Scortechini No. 1991, King's Collector, Nos. 4412, 8176, 10786.

4. **Elæocarpus Scortechinii**, n. sp. King. A tree 30 to 50 feet high: young branches and stipules as in *E. stipularis*. *Leaves* elliptic-oblong otherwise as in *E. stipularis* except that the main nerves are only 8 to 10 pairs, and the under surface is only softly pubescent, not tomentose: length 5·5 to 7·5 in., breadth 2·25 to 3·25 in. *Flower pedicels* longer than in *E. stipularis*, and the flowers the same, except that the ovary is 3-furrowed and 3-celled. *Fruit* oval, 1 to 1·25 in. long and ·5 to ·75 in. in diam., glabrous and smooth when ripe, 1-celled, 1-seeded by abortion.

Perak; Scortechini, No. 1481; Wray, Nos. 1376, 1836, 2251; King's Collector, Nos. 3483, 10303.

This is one of the few plants to which the lamented Father Scortechini gave a manuscript name. He dedicated it to Jack: but as Wallich's species, dedicated to the same botanist, has long priority, I name this after my deceased friend. In everything but its 3-celled ovary and smooth oval fruit it agrees with *E. stipularis*, Bl.

5. **Elæocarpus Wrayi**, n. sp., King. A small tree: leaf-buds,

young branches and inflorescence pale tawny-pubescent. *Leaves* ovate to elliptic-ovate, shortly and bluntly acuminate, the margin cartilaginous, sometimes crenate-serrate, the base always entire and rounded; upper surface glabrous, shining: the lower dull, pale but not glaucous, with scattered black dots, glabrescent except the puberulous midrib and 6 or 7 pairs of rather prominent sub-ascending main nerves; the reticulations distinct, wide; length 2·25 to 3·75 in., breadth 1·25 to 1·75 in.; petiole ·75 to 1·25 in., pubescent. *Racemes* mostly from the wood below the leaves (a few axillary) more than half as long as the leaves. *Flowers* ·2 in. in diam., their pedicels ·1 in. long or less: buds ovoid, blunt. *Sepals* lanceolate, sub-acute, outside tomentose, inside pubescent and the midrib thickened; the edges not incurved. *Petals* broadly cuneate, glabrous, cut for a third or a fourth of their length into about 25 narrow fimbriae; the base truncate. *Torus* of 5 distinct, fleshy, oblong, truncate, several-grooved, velvety glands. *Stamens* 20 to 25, shorter than the petals; filaments less than half as long as the minutely scaberulous anthers; cells sub-equal, the longer sometimes with 2 or 3 short white hairs. *Ovary* globose, pointed, grooved, tomentose, 3-celled. *Style* slightly longer than the ovary, conic-cylindric, pubescent at the base, glabrescent above. *Fruit* ovoid-globular, glabrous, slightly rugose, 1 to 1·25 in. long when ripe, and ·8 to ·9 in. in diam.: pulp rather thin: stone bluntly rugose: putamen very hard, thick: 1 cell with a solitary seed, the other 2 cells abortive.

Perak; on Gunong Bubu at 5000 feet elevation; Wray, No. 3857: Gunong Batu Pateh, Wray, No. 1107; Scortechini, No. 400.

This resembles *E. parvifolius*, Wall. in some respects; but its leaves have more rounded bases, their nerves are rather more numerous and the petioles longer; the flower buds are blunt and not pointed as in that species, and they are tomentose rather than pubescent; also the stamens are more numerous and the ovary is 3-celled. This is found moreover at much higher elevations than *E. parvifolius* which is found at elevations under 1000 feet.

6. ELÆOCARPUS SALICIFOLIUS, n. sp., King. A tree 30 feet high: young branches puberulous. *Leaves* thinly coriaceous, narrowly lanceolate, slightly oblique: acuminate, serrulate-crenulate except at the entire cuneate base; upper surface glabrous, shining, olivaceous when dry, the midrib puberulous; lower dull brown when dry, glabrescent, the midrib puberulous: main nerves about 8 pairs, rather straight, sub-ascending, slender; length 3 to 3·5 in., breadth ·7 to ·9 in.: petiole about ·5 in., puberulous. *Racemes* from the lower axils and from the axils of fallen leaves, nearly as long as the leaves; the slender rachises,

and pedicels pubescent. *Flowers* ·25 in. in diam., the pedicels ·15 to ·2 in. *Sepals* lanceolate, spreading, hoary adpressed-tomentose outside, pubescent inside, the midrib slightly thickened, the edges not incurved. *Petals* a little longer than the sepals, cuneiform, contracted into a rather narrow claw, divided more than half-way down into about eight 3-fimbriate lobes, glabrescent outside, pubescent inside. *Torus* of 5 distinct, subglobose, fleshy, externally grooved glands. *Stamens* 25, shorter than the petals: filaments half as long as the minutely scaberulous shining anthers: cells subequal, pointed, the upper with a minute apical tuft of short hairs. *Ovary* globose, pointed, tomentose, 3-celled. *Style* longer than the stamens, thick and tomentose at the base, cylindric and glabrous above. *Fruit* unknown.

Singapore; King's Collector, No. 1207.

This approaches *E. augustifolius*, Bl. but has smaller more pubescent petals, fewer stamens, and less glabrous leaves. It is also closely allied to *E. hypadenus*, Miq., but has not the characteristic rounded stipules of that species, and the leaf-venation is different. It is also allied to *E. parvifolius*, Wall. from which it differs in its narrower leaves with much more slender veins, and also by its 3-celled ovary.

7. ELÆOCARPUS ROBUSTUS, Roxb. Hort. Beng. 42; Fl. Ind. ii. 598. A tree 40 to 60 feet high; young branches rather stout, at first puberulous; afterwards glabrous, cinereous, lenticellate. *Leaves* thinly coriaceous, ovate-lanceolate to ovate, acuminate or acute, serrate almost to the slightly narrowed rounded rarely cuneate base; both surfaces glabrous, the upper shining; the lower dull, slightly paler, the minute reticulations rather distinct and the 10 to 12 pairs of spreading curving nerves rather prominent: length 3·5 to 9 in., breadth 1·75 to 3·5 in.; petiole 1 to 2·25 in., thickened at the apex. *Racemes* from the branches beneath the leaves, and a few axillary, often nearly as long as the leaves: rachis, pedicels and outer surface of the sepals pubescent. *Flowers* ·5 in. in diam., the pedicels slightly recurved and about ·3 in. long. *Sepals* lanceolate, glabrous inside except the incurved pubescent edges, the midrib thick. *Petals* broadly cuneiform, much contracted in the lower half, the base acute, cut half-way down into about 30 narrow fimbriae, glabrous except the puberulous edges. *Torus* of 5 fleshy, truncate, cushion-like velvety glands. *Stamens* 30 to 50, shorter than the petals, scaberulous; the filaments curved, about one-fifth the length of the anthers; cells subequal, the longer with a small tuft of white hair at its apex. *Ovary* ovoid-globose, with about 6 shallow vertical grooves, tomentose, 3-celled. *Style* cylindric, longer than the ovary, shorter than the petals, pubescent in its lower, glabrous

in its upper half. *Fruit* ovoid-globose, 1 to 1·25 in. long: stone oblong-ovoid, rugose, slightly 3-grooved at base and apex, 3-celled. Mast. in Hook. fil. Fl. Br. Ind. i. 402; Kurz Fl. Burm. i. 169; Pierre Fl. For. Coch-Chine, t. 147; Wight Ic. t. 64; Wall. Cat. 2664. *E. ovalifolius*, Wall. Cat. 2665; C. Müll. Annot. de fam. Elæocarp. 21. *E. amygdalinus*, Wall. Cat. 6857. *E. serratus*, Wall. Cat. 2666 C. *E. oblonga*, Wall. Cat. 2677. *E. aristatus*, Wall. Cat. 2665 B. ? Wall. Cat. 9027. *E. Helferi*, Kurz MSS.; Hook. fil. Fl. Br. Ind. i. 402.

Penang; Curtis. Pahang; Ridley. Andaman Islands. Distrib. British India, from Burmah to the tropical forests of the E. Himalaya.

8. ELÆOCARPUS NITIDUS, Jack Mal. Misc. Vol. i. No. 2, 41; Hook. Bot. Misc. ii. 84. A tree 25 to 35 feet high; young shoots deciduously pulverulent-pubescent, speedily glabrous as are all other parts except the inflorescence; young branches with blackish bark. *Leaves* thinly coriaceous, oblong-lanceolate to elliptic-oblong, acuminate, crenate-serrulate, (sometimes obscurely so) the base cuneate (rounded in var. *leptostachya)*; upper surface shining, the lower dull brown; main nerves 10 to 13 pairs, spreading, forming slender arches a little short of the margin: length 4·5 to 9 in., breadth 1·75 to 2·75 in.; petiole 1·25 to 2 in. thickened at the apex. *Racemes* crowded on the old wood below the leaves and rather more than half as long; rachis, flower-pedicels, and exterior of sepals sparsely puberulous. *Flowers* ·35 in. in diam., their pedicels recurved and rather shorter. *Sepals* shorter than the petals, ovate-lanceolate, acute, puberulous and sometimes lenticellate outside, puberulous inside and the midrib very thick. *Petals* cuneiform, finely and irregularly laciniate for nearly half their length, the entire triangular part with thickened nerves and truncate base, glandular-pubescent especially at the edges. *Torus* of 5 truncate, sub-globular, fleshy, tomentose, cushion-like glands. *Stamens* 15 to 35; the filaments nearly as long as the scabrid obtuse anthers: cells sub-equal, awnless, but sometimes the longer with 2 or 3 small white hairs. *Ovary* globose, slightly pointed, tomentose, 3-celled; style longer than the ovary, slightly thickened below and puberulous. *Fruit* ovoid, or slightly obovoid, smooth, 1·5 in. long, and 1 in. in diam. when quite ripe: stone 3-celled, only one cell bearing a perfect seed. Wall. Cat. 2670; Miq. Fl. Ind. Bat. i. pt. 2, p. 208; Mast. in Hook. fil. Fl. Br. Ind. i. 401; Wall. Cat., No. 2678 (*E. pedunculatus*) in part.

Penang; Jack, Curtis, No. 282, 463. Perak; King's Collector, No. 4926.

The anthers are sometimes without any terminal hairs: sometimes there are a few. I have seen no authentic specimen of Jack's naming, and nothing that I have dissected quite fits his description of *E. nitidus*, of which he describes the stamens as 15: whereas in the plants which I refer to this species they vary from 15 to 35. Jack describes the putamen as 5-ridged and 5-celled: I do not find more than 3 cells in the ovary. In spite, however, of these discrepancies, I believe that Jack's specimen above cited belongs to the species which he named *E. nitidus*. Wallich's specimen No. 2679 has leaves which do not well answer to Jack's description "attenuate at the base." They are only slightly attenuate, and correspond rather with those of his own species *E. leptostachyus* which is sufficiently distinct as regards the shape of its leaves to be maintained as a variety, though not in my opinion entitled to specific rank.

Var. *leptostachya*. *Leaves* elliptic-oblong to elliptic-rotund, acute, the edge obscurely serrate-crenate, often sub-entire, the base rounded: length 6 to 9 in., breadth 2·75 to 4·5 in.; petiole 1 in. to 1·75 in., slightly thickened at the apex. *E. leptostachyus*, Wall. Cat. 2672; C. Müll. Annot. de fam. Elæocarp. 23; Mast. in Hook. fil. Fl. Br. Ind. i. 403.

Penang, Wallich; Perak; King's Collector, Nos. 409, 4905, 10105, 10240; Scortechini, Nos. 195, 1752; Wray, No. 2313.

9. ELÆOCARPUS FLORIBUNDUS, Blume Bijdr. 120. A tree 30 to 40 feet high: young shoots shortly silky; otherwise glabrous, except the inflorescence. *Leaves* thinly coriaceous ovate-elliptic to oblong-lanceolate or oblanceolate, shortly acuminate, coarsely crenate-serrate, the base much narrowed; both surfaces shining, with a blistered appearance when dry: main nerves 5 to 7 pairs; length 3 to 5·5 in., breadth 1·75 to 2·75 in., petiole 1 to 1·5 in., thickened at the apex. *Racemes* usually from below the leaves, sometimes axillary, usually shorter than, but sometimes nearly as long as the leaves; rachises, pedicels and outside of sepals puberulous. *Flowers* ·4 in. in diam., their pedicels about ·35 in. long. *Sepals* lanceolate, outside glabrescent and often pustulate; inside glabrous except the pubescent involute edge, the midrib prominent. *Petals* cuneiform, lobed irregularly half-way down, the lobes divided into about 25 fimbriae, glabrous except the pubescent edges, the lower half veined and thickened, often pustulate. *Torus* of 5 distinct, fleshy, oblong, subglobular, truncate, tomentose glands. *Stamens* about 30, shorter than the petals, scaberulous, the filaments very short, the cells slightly unequal, the longer with a small apical tuft of white hair. *Ovary* ovoid-globose, tomentose, 3-celled. *Style* longer than the stamens, cylindric, puberulous in the lower, glabrous in the upper third. *Fruit* 1 in. long, ovoid-elliptic and slightly apiculate when ripe, oblong and much apiculate when young: stone narrowly ovoid tapering to each end, with 3 vertical grooves and many rather shallow large rugæ, 3-celled, one

or two of the cells sub-abortive, the walls thick. Mast. in Hook. fil. Fl. Br. Ind. i. 401; Miq. Fl. Ind. Bat. i. pt. 2, 210; Kurz Fl. Br. Burm. i. 167; Pierre Fl. Forest. Coch.-Chine, t. 143; Miq. Fl. Ind. Bat. i. pt. 2, 210. *E. serratus*, Roxb. (not of L.) Fl. Ind. ii. 596. *E. grossa*, Wall. Cat. 2661. *E. serratus*, Roxb. ex Wall. Cat. 2666 A, B. partly. *E. oblongus*, Wall. Cat. 2677; C. Müll. Annot. de fam. Elæocarp. 19, f. 30. *E. Lobbianus*, Turcz. in Mosc. Bull. 1858, 235.

The Nicobar Islands. Distrib. British India through Burmah to the E. Himalaya, in tropical forests.

There is no doubt that this is the plant which Roxburgh described as *E. serratus*, Willd.

10. Elæocarpus paniculatus, Wall. Cat. 2663. A tree 15 to 30 feet high: all parts glabrous except the inflorescence, young branches with dark polished bark. *Leaves* thinly coriaceous, lanceolate or oblanceolate-oblong to ovate-oblong, shortly acuminate; the edges entire, slightly wavy; base slightly cuneate, sometimes rounded: both surfaces glabrous, the upper shining; the lower paler and rather dull, the reticulations distinct; main nerves 5 to 7 pairs, sub-ascending, inter-arching freely within the margin: length 4·5 to 6·5 in., breadth 1·65 to 2·75 [illegible].; petiole ·8 to 2 in., glabrous. *Racemes* numerous, from the axils near the apices of the branches, longer than the leaves, erect, rachises puberulous, becoming glabrous: pedicels spreading, slender, minutely pubescent, ·5 to ·65 in. long. *Flowers* about ·5 in. in diam.; buds ovoid with long narrow points. *Sepals* ovate, acuminate, adpressed-sericeous outside; glabrous inside except the pubescent infolded edges. *Petals* not longer than the sepals, ovate acuminate, entire, outside adpressed-sericeous, inside glabrous in the upper villous in the lower half and especially on the thickened midrib and infolded edges. *Torus* a shallow fleshy waved sericeous disk. *Stamens* 50, almost sessile, nearly as long as the petals; anthers sericeous, the cells subequal, the outer with a rather thick terminal awn. *Ovary* narrowly ovoid, sericeous, 2-celled. *Style* longer than the ovary, cylindric, glabrous. *Fruit* ellipsoid, blunt at each end, smooth, glabrous, bluish when ripe, ·4 to ·5 in. long and ·25 to ·35 in. in diam.; pulp rather thick, slightly fibrous; stone bony, minutely tuberculate, 1-celled, 1-seeded. C. Müll. Annot. de fam. Elæocarp. 12; Mast. in Hook. fil. Fl. Br. Ind. i. 407. *Monoceras leucobotryum*, Miq. Fl. Ind. Bat. Suppl. 409. *Monocera Griffithii*, Müll. l. c.

Singapore; Wallich, Anderson. Malacca; Griffith, Maingay (Kew Distrib.) No. 257. Perak; Scortechini, King's Collector; common at low elevations.

11. ELÆOCARPUS PETIOLATUS, Wall. Cat. 2673. A tree 20 to 40 feet high; all parts glabrous except the inflorescence; young branches dark-coloured, about the thickness of a goose-quill. *Leaves* coriaceous, elliptic to elliptic-oblong, acute or shortly and bluntly acuminate; edges entire: base slightly cuneate or rounded; both surfaces shining, the lower slightly paler when dry, the reticulations sharply distinct on both surfaces: main nerves 7 or 8 pairs, sub-ascending, curving and interarching a little within the margin: length 4·5 to 6·5 in., breadth 2 to 2·75 in.; petiole 1·4 to 2·4 in. slender, dark-coloured, slightly thickened at the apex. *Racemes* numerous from the old wood just below the leaves, shorter than the leaves, rachises and pedicels deciduously puberulous. *Flowers* ·5 in. in diam., their pedicels ·35 in.; buds ovoid, rather abruptly pointed. *Sepals* lanceolate, acuminate, almost glabrous externally; quite glabrous internally, the infolded edges alone pubescent, the midrib thickened from base to apex. *Petals* about as long as the sepals, oblong, the apex cut into 10 to 13 narrow glabrous teeth, the lower two-thirds sericeous, cucullate at the base from the infolding of the edges, a large fleshy villous gland in the middle near the base with a quasi-cell at each side of it, the hairs on the inner surface retroversed. *Torus* a 10-lobed fleshy glabrescent disk. *Stamens* 18 to 25, shorter than the petals, with sericeous or glabrescent flat or sub-cylindric filaments much shorter than the shortly puberulous anthers: apex of anther deeply cleft, the outer cell with a sub-recurved thick awn shorter than the filament. *Ovary* ovoid, pointed, glabrous, 2-celled. *Style* as long as the stamens and much longer than the ovary, cylindric, grooved, glabrous. *Fruit* elliptic, blunt at each end, smooth, ·4 to ·6 in. long, and ·3 in. in diam.: the pulp thin, with very few fibres; stone very slightly rugose, 1-celled, 1-seeded. *Monocera petiolata*, Jack Mal. Misc. i. No. v, 43; ex Hook. Bot. Misc. ii. 86; Cum. et Zoll. in Bull. Mosc. xix, 495. *Monoceras petiolatum*, Miq. Fl. Ind. Bat. i. pt. 2, p. 212; Kurz Fl. Burm. i. 164; Pierre, Fl. Forest. Coch.-Chine, t. 140. *Elæocarpus integra*, Mast. (not of Wall.) in Hook. fil. Fl. Br. Ind. i. 408.

Malacca; Griffith No. 699; Maingay, No. 256, (Kew Distrib.); Derry. Singapore; Hullett, King. Penang; Curtis, No. 383. Perak; Scortechini, King's Collector, Wray, very common at low elevations. Distrib. Sumatra, Beccari, N. S. No. 668.

This is undoubtedly the *Monocera petiolata* of Jack; that it is the *Elæocarpus integra* of Wall. (Cat. No. 2668) I very much doubt. Wallich's No. 2668 was collected in Silhet from which no specimen anything like this has been collected since his day. In fact there is no evidence to show that this species is found in any part of British India (as distinguished from British Malaya), although Kurz includes it in his

Flora of Burmah. This species is a smaller tree than *E. pedunculatus*, which, however, it closely resembles, differing chiefly in the shape of the leaves, the nearly glabrous sepals and in the larger number of stamens. *E. ovalis*, Miq. (a species from Sumatra) must be very nearly allied to this. I have seen only a fruiting specimen of *E. ovalis*, but, except in having leaves of thicker texture and slightly larger fruit, I see little to prevent its being referred here.

12. **Elæocarpus Griffithii**, Mast. in Hook. fil. Fl. Br. Ind. i. 408. A tree 30 to 40 or over 70 feet high, all parts glabrous except the inflorescence; young branches almost as thin as a crow-quill, dark-coloured. *Leaves* thinly coriaceous, ovate-lanceolate to lanceolate, acuminate, the edges cartilaginous with shallow mucronate crenulations, or subentire with remote marginal black points, the base sub-cuneate or rounded: both surfaces shining, the reticulations minute and distinct: main nerves 5 or 6 pairs spreading, forking and interarching at some distance from the margin, not prominent: length of blade 2·5 to 3·75 in., breadth ·9 to 1·5 in., petiole ·5 to 1 in. *Racemes* from the upper axils, longer than the leaves, rachises and pedicels softly and minutely pubescent. *Flowers* ·5 in. in diam.; pedicels thickened at the apex, ·6 to ·8 in. long: buds ovoid-conic. *Sepals* lanceolate, acuminate, finely adpressed sericeous externally, glabrous internally except the pubescent infolded edges and the thickened sometimes sericeous midrib. *Petals* about as long as sepals, ovate, acuminate, the apex irregularly 2 or 3-toothed with 2 or 3 lateral fimbriæ, outside minutely adpressed-sericeous, inside retroversed hirsute especially on the large gland near the base; edges in the lower two-thirds much infolded so as to form with the gland 2 quasi-cells. *Torus* a shallow, acutely 10-lobed, fleshy disk. *Stamens* 35 to 40, shorter than the petals: filaments short, sericeous as are the unequally 2-celled anthers: outer cell with a tapering awn $\frac{1}{4}$ to $\frac{1}{3}$ of its own length, the inner with a few apical hairs. *Ovary* narrowly ellipsoid, tapering, glabrous except a few silky hairs, 2-celled. *Style* cylindric, grooved, glabrous, longer than the ovary. *Fruit* ellipsoid, blunt at both ends, smooth, ·5 in. long and ·3 in. in diam.: pulp thin with a few fibres; stone slightly rugose, 1-celled, 1-seeded. Kurz in Journ. As. Soc. Beng. pt. 2, for 1870, p. 68; for 1874, pt. 2, 123; For. Flora Burm. i. 164. *Monocera tricanthera*, Griff. Not. pt. 4, 518, t. 619, fig. 3. *Monocera Griffithii*, Wight Ill. i. 84, (not of Müll.). *Monocera holopetala*, Zoll. et Cum. Bull. Mosc. xix, 496. *Monoceras odontopetalum*, Miq. Fl. Ind. Bat. Supp. 409.

Malacca; Griffith, Maingay, No. 257/2 (Kew Distrib.). Perak, at low elevations; King's Collector, Wray. Penang; King's Collector. Distrib. Tenasserim, Helfer, No. 714, Kew Distrib.

13. Elæocarpus Hullettii, n. sp., King. A tree 30 to 40 feet high: young branches very slender, dark-coloured; all parts glabrous except the inflorescence. *Leaves* thinly coriaceous, lanceolate to ovate-lanceolate, acuminate; edges slightly cartilaginous, entire or remotely and obscurely serrate; the base cuneate or rounded: both surfaces shining, the reticulations minute, elongate and rather distinct on the lower; main nerves 7 or 8 pairs curving, interarching within the edge, rather faint; length of blade 2·5 to 3 in., breadth ·75 to 1·4 in.; petiole ·65 to ·9 in., slender. *Racemes* from the leaf-axils below the apex, crowded, usually shorter than, but sometimes as long as, the leaves, the rachises glabrescent or puberulous, the pedicels silky puberulous. *Flowers* ·3 in. in diam., their pedicels ·35 in. long. *Sepals* linear-lanceolate, acuminate; externally adpressed-pubescent; internally glabrous below, puberulous near the apex and on the infolded edges. *Petals* ovate, concave at the base, narrowed to the 10 to 12-fimbriate apex; outside glabrous, inside villous on the much-thickened base of the midrib, otherwise puberulous. *Torus* very shallow, deeply 10-lobed, sericeous. *Stamens* 20, slightly shorter than the petals: filaments nearly as long as the minutely scaberulous anthers, outer cell with tapering awn nearly as long as itself. *Ovary* ovoid, pubescent, 2-celled. *Style* as long as the petals and much longer than the ovary, subulate, puberulous below, glabrous above. *Fruit* ellipsoid, blunt at each end, smooth, ·6 in. long, ·35 in. in diam.; pulp thin, very slightly fibrous: stone rugulose, rather thick, bony, 1-celled, 1-seeded.

Singapore; Hullett, No. 132. Penang; Curtis, No. 1091, King's Collector, No. 1475. Perak, on low hills; Scortechini, King's Collector.

A species not unlike *E. Griffithii*, Wall. but with smaller flowers and much shorter racemes.

14. Elæocarpus pedunculatus, Wall. Cat. 2678 in part. A tree 40 to 80 feet high: glabrous except the inflorescence: young branches nearly as thin as a crow-quill, polished, dark-coloured; their apices and the older branchlets rough and thickened. *Leaves* coriaceous, oblanceolate or narrowly elliptic-oblong, obtuse or slightly narrowed at the apex, the base very cuneate; the edges cartilaginous, remotely-mucronate crenate-waved, slightly recurved when dry: both surfaces shining: the lower very slightly the paler and with the minute reticulations distinct; main nerves 5 to 7 pairs, interarching at some distance from the edge; length of blade 3 to 4·5 in., breadth 1·25 to 1·8 in., petiole ·75 to 1·2 in. *Racemes* axillary but mostly from axils of fallen leaves, 3 or 4 in. long, rachises and pedicels hoary-pubescent. *Flowers* ·3 in. in diam., buds narrowly ovoid, sub-acute; pedicels recurved, slightly longer than the

flowers. *Sepals* lanceolate, sub-acute, minutely adpressed-sericeous externally, almost glabrous internally except the pubescent inverted edges, the midrib equally thickened from base to apex. *Petals* slightly longer than the sepals, oblong, expanded at the base, the apex broad, cut into 10 to 15 cylindric filiform glabrous fimbriæ one-fourth of the length of the petals: lower part sericeous on both surfaces but especially on the inner (where the hairs are reversed), cucullate with the edges much infolded, and with a large basal gland at each side of which is an imperfect cell. *Torus* a fleshy deeply 10-lobed glabrescent disc. *Stamens* about 15; slightly shorter than the petals, filaments pubescent, less than half the length of the puberulous sub-equal anthers: outer cell with a short sub-recurved awn. *Ovary* ovoid, pointed, smooth, glabrous, 2-celled. *Style* as long as the stamens, cylindric, grooved, glabrous. *Fruit* ellipsoid, blunt at each end, ·5 in. long and ·3 in. in diam., 1-celled, 1-seeded; pulp rather thin, slightly fibrous, stone minutely rugulose, 1-celled, 1-seeded. Mast. in Hook. fil. Fl. Br. Ind. i. 408.

Singapore; Wallich, Ridley. Malacca; Griffith, No. 698, Maingay No. 258 (Kew. Distrib.). Penang; Curtis, No. 256. Perak; Scortechini, King's Collector, Nos. 269, 6907, 10831.

Miquel's *Monocera Palembanica*, from Sumatra, judging from the only authentic specimen which I have seen (and which has no flowers), if not identical with this must be a very closed allied species. Under his Catalogue, No. 2678, Wallich issued two species, the above described as *E. pedunculatus*, and another which is clearly *E. nitidus*, Jack.

15. ELÆOCARPUS KUNSTLERI, n. sp, King. A tree 50 to 70 feet high: young branches as thick as a goose-quill, polished, thickened and rough at the apex: all parts glabrous except the inflorescence. *Leaves* coriaceous, rotund-obovate, the apex broadly obtuse, sometimes with a short broad apiculus, rather abruptly narrowed from below the middle to the acuminate base; both surfaces, shining, glabrous; main nerves about 10 pairs, ascending, interarching freely inside the entire or crenate-serrate edge: prominent beneath; the reticulations rather faint; length 5 to 8 in., breadth 2·75 to 3·75 in., petiole ·5 to ·7 in., pubescent. *Racemes* crowded from the axils of fallen leaves and a few axillary, less than half as long as the leaves, 6 to 9-flowered: rachises and pedicels slender, puberulous, glabrous when old. *Flowers* ·6 in. in diam., their pedicels ·5 in. or more long. *Sepals* lanceolate, sub-acute, pubescent on both surfaces, the midrib thickened and villous at the base inside. *Petals* about as long as the sepals, oblong slightly obovate, obtuse, thickened in the lower half, the apex with 6 to 8 rather broad teeth, adpressed-sericeous outside, densely villous inside. *Torus* a shallow

toothed villous cup. *Stamens* 28 to 30, shorter than the petals; filaments nearly as long as the minutely scaberulous anthers, swollen in the lower half, the apex of the outer anther-cell with a short recurved awn. *Ovary* ovoid, pointed, tomentose, 2-celled. *Style* cylindric, as long as the petals, puberulous below, glabrous at the apex. *Fruit* unknown.

Perak; at elevations under 1000 feet, King's Collector, No. 8328.

A species near *E. apiculatus*, Mast. but with broader, blunter leaves more abruptly attenuated to the base and quite glabrous, also with smaller flowers.

16. ELÆOCARPUS OBTUSUS, Blume Bijdr. 125. A tree 30 or 40 feet high: young shoots minutely pale pubescent, ultimately glabrous. *Leaves* coriaceous, oblong-obovate, the apex rounded or retuse, gradually narrowed from above or below the middle into the acute or acuminate base; the edges sub-entire or with shallow mucronate crenations; upper surface glabrous, shining; the lower minutely puberulous at first, ultimately glabrous, the reticulations very minute and rather distinct; main nerves 6 to 8 pairs, sub-ascending, not much curved, rather prominent below, scrobiculate at their origin from the midrib; length 4·5 to 6·5 in., breadth 2·25 to 2·75 in., petiole ·75 to 1·1 in. *Racemes* axillary, sometimes from the axils of fallen leaves, less than half as long as the leaves, few-flowered; rachises and pedicels puberulous when young, often nearly glabrous when old. *Flowers* ·9 in. in diam; their pedicels slender, ·75 to 1 in. long. *Sepals* oblong-lanceolate, outside minutely pubescent, inside sparsely adpressed-sericeous, the midrib thickened. *Petals* longer than the sepals, cuneiform, the base rather broad; the lower third thickened and its edges infolded, the apex with 8 to 10 rather broad teeth sometimes 2-lobed, sericeous on both surfaces but especially on the thickened lower third. *Torus* a wavy, sub-10-toothed, fleshy, sericeous cup. *Stamens* 30 to 50, shorter than the petals: the filaments slender, slightly swollen in the lower half, as long as the pubescent anthers; outer anther cell with a thin tapering awn about as long as itself. *Ovary* ovoid, sericeous or pubescent, 2-celled. *Style* tapering, cylindric, nearly as long as the petals, slightly grooved, puberulous. *Fruit* ovoid, oblong, not pointed, 1·5 in. long, and ·9 in. in diam., smooth: stone boldly tuberculate, 1-celled, 1-seeded. *Monoceras obtusum*, Hassk. Tijds. Nat. Gesch. xii. 136; Miq. Fl. Ind. Bat. i. pt. 2, p. 212. *E. Monoceras*, Cav. (fide Mast. in Hook. fil. Fl. Br. Ind. i. 405). *E. littoralis*, Kurz (not of Teysm. and Binn.) in Journ. As. Soc. Beng. 1874, pp. 132, 182; For. Fl. Burm. i. 167.

Malacca; Griffith, (Kew Distrib.) No. 700. Perak, at low elevations; King's Collector, Nos. 1096, 4671; Scortechini 1396. Pahang; Ridley, 1312. Distrib. Java, Borneo, Sumatra, Burmah.

E. Monoceras, Cav. to which Dr. Masters reduces this, was founded by its author on specimens from the island of Luzon. The species, however, is not given in the latest Flora of the Philippines (that of Sig. Vidal); and, as the original description of Cavanilles does not quite agree with the flowers of the Perak specimens, I think it safer not to go farther back them Blume's name, leaving it to be settled hereafter whether *E. obtusus*, Bl. is really the same plant as the Philippine *E. Monoceras*. The Perak plant is closely allied to *E. littoralis*, T. B. (for which Kurz mistook it); and also to the smaller-flowered Sumatran *E. cuneifolius*, Miq.

17. ELÆOCARPUS APICULATUS, Mast. in Hook. fil. Fl. Br. Ind. i. 407. A tree 50 to 60 feet high: young branches glabrous, their apices much thickened, rough and puberulous. *Leaves* coriaceous, obovate or oblanceolate-oblong, slightly narrowed to the obtuse, sub-acute, or shortly apiculate apex, and much narrowed to the base, the edges sub-entire or with coarse shallow crenations; both surfaces glabrous, shining, the midrib on the lower glabrescent when young; under surface pale, the reticulations minute, rather distinct; main nerves 12 to 14 pairs, slightly prominent beneath and interarching freely within the margin, not scrobiculate; length 7 to 10 in.; breadth 2·5 to 3·75 in., petiole ·3 to 1 in., thickened at the apex. *Racemes* few, mostly from the axils of fallen leaves, usually about a fourth but sometimes half the length of the leaves; the rachises and pedicels softly pubescent. *Flowers* ·9 in. in diam.; buds oblong, sub-obtuse or pointed, their pedicels ·75 to 1·25 in. *Sepals* oblong-lanceolate, rufous-pubescent outside, glabrous or glabrescent inside, the edge infolded and pubescent, the midrib thickened from base to apex. *Petals* slightly longer than the sepals, oblong-cuneiform to cuneiform, cut from one-fourth to one-fifth of their length into numerous rather broad fimbriæ; externally adpressed-sericeous in the lower half, glabrous in the upper; internally thickened and villous in the lower, glabrous in the upper, half. *Torus* a shallow fleshy puberulous cup. *Stamens* 30 to 40, half as long as the petals; filaments shorter than the minutely scaberulous anthers, bulbous at the base: outer anther-cell with short or long apical recurved awn. *Ovary* ovoid, rufous-tomentose, pointed, 2-celled. *Style* as long as the petals, conic-cylindric and pubescent in the lower half, filiform and glabrous in the upper. *Fruit* (fide Masters) "1 in. long, resembling the fruit of a *Diospyros*." *Terminalia moluccana*, Wall. (not of Lamk.) Cat. 3969.

Penang; Wallich. Malacca; Griffith, Maingay, No. 262 (Kew. Distrib.). Perak; Scortechini, King's Collector; common at low elevations.

Allied to *E. Kunstleri*, King and to *E. rugosus*, Roxb. In fact I am inclined to believe that it is merely a form of the latter, from which it should not be separated specifically. Dr. Prain has called my attention to Wallich's sheet No. 3969, which is unmistakeably this species, and has nothing to do with *Terminalia moluccana*, Lamk. which is *T. Catappa*, Linn.

18. ELÆOCARPUS ARISTATUS, Roxb. Hort. Beng.: Fl. Ind. ii. 599. A tree 30 to 60 feet high: young branches of about the thickness of a swan's quill, smooth, thickened and rough towards the apex. *Leaves* thinly coriaceous, obovate, shortly and bluntly apiculate, remotely crenate-serrate, narrowed to the base, glabrous on both surfaces; main nerves 7 to 10 pairs, slender, curving, scrobiculate at the origin from the midrib; length 6 to 8·5 in., breadth 2·75 to 3·75 in., petiole ·5 to ·7 in. *Racemes* axillary and from the axils of fallen leaves, often nearly as long as the leaves, 3 to 5-flowered, rachises and pedicels puberulous or glabrous. *Flowers* nearly 1 in. in diam.; buds cylindric, pointed; pedicels ·8 to 1·25, or longer in fruit. *Sepals* as in *E. apiculatus*. *Petals* also as in *E. apiculatus* but broadly cuneiform, and lobed as well as fimbriate. *Stamens* 50, otherwise as in *E. apiculatus*. *Ovary* less velvety, but otherwise as in *E. apiculatus*. *Fruit* ovoid, smooth, 1·25 to 1·4 in. long and ·8 to ·9 in. in diam., pulp rather thick; stone oblong, flattened, pointed at each end, rugose, slightly ridged in the middle of each side, 1 in. long, 1-celled, 1-seeded. Mast. in Hook. fil. Fl. Br. Ind. i. 405. *E. rugosus*, Wall. Cat. No. 2659 (not of Roxb.).

Andaman Islands; King's Collector. Distrib. Brit. India in Burmah, Chittagong, Sylhet, Assam, Khasia Hills and base of Eastern Himalaya.

This is very closely allied to *E. rugosus*, Roxb.—a species originally discovered by Roxburgh in Chittagong, but specimens of which from that province are very rare in collections. The plants distributed under this name by Wallich as No. 2659 of his Catalogue were not collected there but in Sylhet, while some of them were taken from trees cultivated in the Botanic Garden, Calcutta. They are not *E. rugosus* at all, but *E. aristatus*, Roxb.; and they differ from true *E. rugosus* in having their young branches thinner and smoother; and in leaves which are always glabrous, not so gradually narrowed to the base and with much longer petioles. Their racemes are also more numerous, the petals more broadly cuneiform and the stamens more numerous, (50 as against 30 to 40). The pulp of the fruit is thicker in Andamans specimens of this than in those from Sylhet and Assam; and the stone is proportionately smaller. There is in Assam and Burmah a plant closely allied to this which has smaller leaves with very large scrobiculæ on the lower surface at the junction of the petioles with the midrib. This has been named *E. simplex* by Kurz, (Fl. Burm. i. 165.) A similar form occurs in Travancore and has been named *E. venustus* by Beddome (Flora Sylvatica, t. 574).

19. ELÆOCARPUS POLYSTACHYUS, Wall. Cat. 2671. A small tree: young shoots rather stout, minutely tawny-tomentose. *Leaves* coriaceous, pale when dry, elliptic to elliptic-oblong, abruptly and shortly acuminate; the edges rather remotely serrulate except at the base, sub-entire when old; the base broad, rounded; upper surface glabrous; the lower sparsely and minutely sub-adpressed pubérulous, the midrib pubescent main nerves 7 to 10 pairs, ascending, curving, prominent beneath, the reticulations minute, faint: length 5·5 to 7·5 in., breadth 2·25 to 3·5 in.; petioles 2·5 to 4 in., minutely tawny-tomentose, slightly thickened at the apex. *Racemes* slightly longer than the petioles; the rachises, pedicels and outside of sepals densely minutely tawny-tomentose. *Flowers* ·35 in. in diam., their pedicels ·4 in., recurved, buds sub-globose. *Sepals* ovate, acute; inner surface glabrous, except the pubescent edges, the midrib thickened. *Petals* elliptic, little longer than the sepals, the apex obtuse, sometimes slightly lobed, not fimbriate: villous on both surfaces, the hairs on the inner reversed. *Torus* of 5 retuse thin densely villous glands. *Stamens* half as long as the petals: filaments nearly as long as the hispid-pubescent anthers; cells subequal, awnless, beardless. *Ovary* ovoid, blunt, densely villous, 2-celled. *Style* about as long as the ovary, puberulous. *Fruit* oblong, blunt, ·6 in. long and ·35 in. in diam., smooth, glabrous; stone minutely but sharply rugose, 1-celled, 1-seeded, pulp thin and slightly fibrous. C. Müll. Annot. de fam. Elæocarp. 20, f. 13; Mast. in Hook. fil. Fl. Br. Ind. i. 403.

Singapore; Wallich, Hullett, Ridley. Malacca; Maingay, Nos. 264, 266, (Kew Distrib.).

20. ELÆOCARPUS JACKIANUS, Wall. Cat. 2679. A tree 40 to 80 feet high: young branches stout, densely rufous-tomentose. *Leaves* coriaceous, ovate-oblong to elliptic, rarely oblong-ovoid, shortly acuminate or acute, edges entire, recurved; the base rounded or slightly narrowed: upper surface rather dull and pale when dry; glabrous, the midrib alone sometimes pubescent, the lower softly rufous-tomentose, becoming sub-glabrescent when very old, the minute reticulations distinct; main nerves 8 to 10 pairs, sub-ascending, curving, prominent on the lower, impressed on the upper, surface: length 4 to 7·5 in., breadth 2·5 to 4·5 in.; petiole 1·75 to 3 in., stout, thickened at each end, tomentose. *Racemes* crowded on the branches below the leaves, sometimes

axillary, shorter than the petioles, the rachises pedicels and outside of sepals softly rufous-tomentose. *Flowers* ·25 in. in diam.; their pedicels about ·25 in. long, recurved. *Sepals* 4, ovate, acute; inside puberulous with infolded tomentose edges, the midrib thickened. *Petals* 4, very little longer than the sepals, oblong, slightly obovate, obtuse, shortly 8- to 10-toothed, villous outside, glabrescent inside, the edges villous. *Torus* a shallow rufous-villous cup. *Stamens* about 12, shorter than the petals, scaberulous, the filaments about half as long as the anthers; anther-cells slightly unequal, pointed, the longer sometimes with, but usually without, a minute tuft of white hair. *Ovary* (absent in most flowers) ovoid-oblong, glabrous, imperfectly 2-celled, one cell only perfect. *Fruit* ovoid, tapering at each end, smooth, shining; pulp thin, slightly fibrous: stone sharply rugulose, crustaceous, 1-celled. 1-seeded. *Monocera ferruginea*, Jack Mal. Misc. ex Hook. Bot. Misc. ii. 86.

Singapore; Jack, Kurz. Penang; Curtis, No. 465. Malacca; Griffith, No. 693; Maingay, No. 259, (Kew Distrib.). Perak; King's Collector; common at low elevations.

This species approaches *E. glabrescens*, Mast. but is larger in all its parts and much more persistently tomentose. This is unrepresented by any Wallichian specimen at Kew, and is therefore referred to by Masters in the *Flora of Brit. India* only in a note (i. 409).

21. **Elæocarpus glabrescens**, Mast. in Hook. fil. Fl. Br. Ind. i. 403. A tree: young branches and petioles densely rufous-tomentose. *Leaves* coriaceous, ovate to ovate-lanceolate, acuminate; edges entire, slightly revolute; base rounded or slightly narrowed; upper surface glabrous, the midrib pubescent; lower surface at first rufous-pubescent ultimately glabrescent or glabrous, the reticulations minute but distinct: main nerves 5 or 6 pairs, prominent beneath, spreading, curved: length 2·5 to 3·5 in., breadth 1·2 to 1·6 in.; petiole 1·25 to 1·75 in., slightly thickened at the apex, glabrescent when old. *Racemes* rather longer than the petioles, axillary and from the axils of fallen leaves; rachises and pedicels sparsely pubescent. *Flowers* ·25 in. in diam., the pedicels about ·2 in. long, recurved. *Sepals* 4, sub-erect, ovate-lanceolate, thickened at the base, pubescent outside, glabrescent inside with puberulous edges, the midrib thickened. *Petals* 4, slightly longer than the sepals, oblong, the apex obtuse and with 6 to 12 short unequal teeth: pubescent outside, glabrescent inside, the edges shortly villous. *Torus* a very shallow villous cup. *Stamens* 10 or 12, shorter than the petals: filaments short: anthers scaberulous, the cells slightly unequal, slightly pointed, usually without small apical tufts of minute hair. *Ovary* (absent in many flowers) ovoid, glabrous, 1-celled. *Style* short, conic, glabrous. *Fruit* (*fide* Masters) the size of a cherry, 1-celled, 1-seeded.

Malacca; Maingay No. 256 (Kew Distrib.). Penang; Stoliczka; on Government Hill at 2,500 feet, Curtis, No. 1092.

The Malacca and Penang specimens agree with a specimen at Kew which Miquel has named *E. tomentosus*, Bl. The two species are no doubt close together: but Blume describes the leaves of his *E. tomentosus*, as "setaceous-denticulate" which is not the case here. This tree appears to be uncommon, for Herbarium specimens of it are very few.

22. ELÆOCARPUS PUNCTATUS, King, n. sp. A small tree; all parts glabrous except the puberulous inflorescence; young branches thicker than a crow-quill, rough. *Leaves* coriaceous, oblong-lanceolate, acute, the edges cartilaginous, crenate or serrate, sometimes with a short seta on each tooth, the base much narrowed into the petiole, entire: both surfaces shining; main nerves 8 to 10 pairs, slender but distinct beneath as are the reticulations: length 1·75 to 3 in., breadth ·5 to 1·1 in.; petiole ·25 to ·3 in., channelled in front. *Racemes* axillary and from the axils of fallen leaves, much shorter than the leaves; rachises and pedicels puberulous, becoming glabrescent. *Flowers* ·25 in. in diam., their pedicels ·2 in., recurved. *Sepals* 4, oblong-lanceolate, sub-acute, puberulous on both surfaces, the edges thickened and pubescent but not recurved: midrib thickened inside. *Petals* 4, obovoid-oblong, apex obtuse with 5 to 7 short broad teeth, glabrous. *Torus* a shallow wavy pubescent cup. *Stamens* 8 to 12; filaments less than half as long as the scaberulous obtuse beardless awnless anthers: the cells sub-equal. *Ovary* ovoid, glabrous, slightly grooved, 2-celled. *Style* about as long as the ovary, cylindric, grooved, puberulous. *Fruit* oblong-ovoid, pointed, narrowed to both ends, glabrous, shining, pale, ·5 in. long and ·25 in. in diam.; pulp thin, and slightly fibrous; stone crustaceous, sharply rugose, 1-celled by abortion, 1-seeded. *Elaeocarpus Acronodia*, Mast. in Hook. fil. Fl. Br. Ind. i. 408 *in part*. *Acronodia punctata*, Bl. Bijdr. 123; Miq. Fl. Ind. i. pt. 2, p. 213.

Perak; on Ulu Batang Padang, at 5000 feet, Wray. Malacca. Distrib. Java, Sumatra.

The leaves of specimens from Java and Sumatra are larger than those from Perak and have numerous black dots on the lower surface, whereas those from Perak have no such dots. In other respects the specimens agree: but the Perak material which I have as yet seen is scanty. The plant issued by Wallich as *E. punctatus*, (No. 2676 of his Catalogue) is not the *Acronodia punctata* of Blume, but an altogether different plant. Wallich's specimens are very bad, and Dr. Masters (Fl. Br. Ind. i. 406) suggests that perhaps the leaves are those of a *Pterospermum*; in reality they belong to a species of *Parinarium*.

23. ELÆOCARPUS MASTERSII, King. A tree 30 to 50 feet high: young branches as thin as a crow-quill, smooth, puberulous; otherwise glabrous except the inflorescence. *Leaves* thinly coriaceous, oblong-lanceolate to ovate-lanceolate, acuminate, often caudate; the edge slightly cartilaginous, remotely and faintly serrate, the base cuneate; both surfaces shining and with the rather transverse reticulations distinct; main nerves 6 to 8 pairs, faint, spreading, interarching within the edge: length of blade 2·75 to 4·5 in., breadth ·8 to 1·4 in.; petiole ·5 to ·75 in., slender. *Racemes* few-flowered, less than half as long as the leaves, from the axils under the apex; rachises and pedicels puberulous, becoming glabrous. *Flowers* ·2 in. in diam.; buds narrowly ovoid, pointed. *Sepals* 4, ovate-lanceolate, subacute, puberulous or glabrescent outside: glabrous inside on the lower, often puberulous in the upper half and slightly on the infolded edges. *Petals* 4, oblanceolate or narrowly cuneate, the rounded apex with about 15 short teeth, thickened towards the base, veined, glabrous. *Torus* a very shallow wavy pubescent disk. *Stamens* 8 or 9, shorter than the petals, filaments nearly as long as the sub-scaberulous anthers; the cells blunt at the apex, awnless. *Ovary* (absent in many flowers), ovoid, blunt, glabrous, 2-celled. *Style* about as long as the ovary, thick, cylindric, grooved, glabrous. *Fruit* ovoid-globose, the apex slightly pointed, smooth, ·35 in. long and ·25 in. in diam.; pulp thin and without fibres: stone smooth, cartilaginous, 1-celled, 1-seeded. *Elaeocarpus Acronodia,* Mast. in Hook. fil. Fl. Br. Ind. i. 401, in part (excl. syn. *Acronodia punctata,* Bl.).

Malacca; Griffith, No. 681; Maingay, No. 261, (Kew Distrib.). Singapore; Hullett, Ridley. Perak; common at low elevations, King's Collector, Scortechini, Wray.

This is a true *Acronodia* allied to *A. punctata,* Bl. (= *Elæocarpus punctatus,* King, not of Wall.) but is distinguished by its less acuminate longer petiolate leaves, slightly different flowers and smaller more globose fruit. This occurs at low elevations and is a tree whereas the other is a shrub and is found as high as 7000 feet.

EXCLUDED SPECIES.

ELÆOCARPUS PUNCTATUS, Wall. Cat. 2676 is, (as Kurz pointed out) no *Elæocarpus* but a *Parinarium.* Maingay's Nos. 621 and 621/2 (Kew Distribution) seem to be conspecific with it.

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V.—*The Butterflies of Sumba and Sambawa, with some account of the Island of Sumba.*—*By* WILLIAM DOHERTY, *Cincinnati, U. S. A. Communicated by the* NATURAL HISTORY SECRETARY.

[Received April 9th :—Read May 6th, 1891.]

(With Plate II.)

The chain of the Lesser Sunda Islands, extending from Java eastwards to Timor Laut and New Guinea, is of great interest from many points of view, but especially from the ethnologist's. For, whereas a slight tincture of Muhammadan civilization, leading to the entire loss of the native product, has made the people of the Malay Peninsula, Sumatra, and Borneo the most uninteresting of all the sons of men, and only the minutest differences distinguish the natives of Penang from those of Macassar, fifteen hundred miles away, every little island east of Java has an astonishing wealth of peculiarities.

Taking the question of religion and government, Bali, the first, is a densely inhabited island, the home of an ancient civilization. The people are of the Hindu faith, the four original castes still prevail there as they did in India in the time of Manu, and suttee, extinct everywhere else, still flourishes. In Lombok, a Hindu aristocracy rules a Muhammadan proletariat of a more recent and less pronounced civilization. In Sambawa* there are four Muhammadan kingdoms of considerable age, while a few tributary heathen tribes, but little inferior to them in refinement, inhabit the mountains. In part of Flores, the governing race is a tribe of Muhammadan slave-traders, the curse of all that region, and the pagan mountaineers are in a more or less savage state. In Sumba and Timor there are independent heathen tribes. In Solor, Savu (better written Sau or Sawu), and Roti a large part of the population is Christian. The Dutch have no possessions in these islands, except the town of Boleling in Bali, the fort at Bima in Sambawa, and the neighbourhood of Kupang in Timor. But owing to their command of the sea, they have a considerable, and I believe an increasing influence with the trading community, and with many of the native princes. At the present moment they are trying to get possession of Middle Flores, where tin has been discovered, and, if successful, the occupation must have the happiest effect on all the surrounding islands.

From the philologist's standpoint, all the dialects from Bali to Kupang belong to the Javanese branch of the Polynesian family. In Eastern Timor and the islands beyond, some of the languages are of a totally different type, probably that of the original Negrito inhabitants.

As regards race, no part of the world excels these islands in interest. In and east of Timor, the prevalence of wavy or frizzly-haired tribes, generally of low stature, indicates the Negrito as the first occupant. In Sumba the Polynesians are still numerous, and form the ruling race, while traces of them occur in Sambawa,† and even in the mountains of the Celebes. The people of Roti are a strikingly handsome tribe looking somewhat like the better class of Tamils or Telugus, and their origin is certainly a puzzle. Mr. Wallace suggests that they may be of Portuguese blood, introduced by some unrecorded shipwreck. But they themselves say they came from Serang (Ceram). A somewhat similar race occurs at Melolo in Eastern Sumba, and, I hear, in Flores. In Savu, the people have an obvious strain of Negrito blood, but some resemble the Rotinese, while universal tradition ascribes their

* So pronounced, also sometimes pronounced Sembawa, or, if written in the Hunterian manner, Sambáwá. The Dutch call it Soombawa, which is not only incorrect, but confuses it, with Sumba (Soemba). It is remarkable that the inhabitants of the island have no name for it, Sambawa being simply the name of the western sultanate. Nothing could more surprise a native of Bima, than to be told that Bima and Sambawa are on the same island. The same is true of Flores, for that pretty word is purely European, and there is no native name for the whole island. I see that the island Dutch propose to call it "Soenda" so that these three great neighbouring islands are to stand as Soenda, Soemba, and Soembawa!

† Lengota, the *glarang* or headman of Kala in the mountains of Sambawa, is a fine example of a Polynesian.

origin to Sumba, and their language scarcely differs from Sumbanese. In Sambawa, Lombok, and Bali, the flood of Mongolian immigrants has swept away nearly all traces of the original inhabitants, and the people are indistinguishable from the Malays or Siamese. The same race has entered all the islands, I do not think there is a single island in the Archipelago or the Pacific where the Mongolians have not profoundly modified the original population, whether Polynesian or Negrito. In Sumba the mixture is of great interest, because it presents the same features as in New Zealand and among the eastern and higher tribes of American Indians, namely, a race chiefly or largely Mongolian in blood, but Polynesian in language and manners, and ruled by a princely caste of genuine Polynesian blood. Till I visited Sumba I had no idea of the possibility of this state of affairs so far west. But since then I have been struck with the prevalence of Polynesian features, and even to a certain extent of Polynesian manners* among the higher tribes between Assam and Burma, namely, some of the Naga tribes—the Angamis, Lhotas and Kachhas—the Chins and the Lushais. This country may well have been the starting point of this fine race, whence they have extended their conquests eastwards to New York and Yucatan and westwards to Madagascar, and where, judging from what I saw, they may yet survive after their extermination, now so rapidly going on, is complete everywhere else in the world.

Mr. Alfred Russell Wallace has formed all the Lesser Sunda islands, except Bali, separated from Java only by a narrow strait, into his Timorian division of the Austro-Malayan region. So far as the birds are concerned, he seems to have had good reason for this, for out of 160 land-birds known from the group, just half are found nowhere else, a larger proportion than exists even in the peculiar Celebesian fauna. On examination, however, it does not appear that the group is a zoological province in the same sense as is the Celebes. In that island, a great number of peculiar species, and a certain number of peculiar genera, range over the whole island from Menado to Macassar. But the Timor group contains hardly any peculiar genera,† and the peculiar species are generally confined to one or two of its component parts.‡

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* As regards language, the euphonic and structural rules are remarkably alike, but the roots of Naga words are generally as wholly different from those of the Pacific islanders, as theirs are again from those of the American Polynesians.

† Two genera of butterflies, *Ancistroides* and *Jatana*, have been described from Timor only. But I must confess that I cannot find in either any generic character separating it from its allies.

‡ On examining the British Museum Catalogue of Birds as far as completed—*Passeres* and *Picidæ*—I find their distribution as follows. No genera are mentioned as peculiar to the Timor Group, or to any part of it. Only two species are men-

It is simply a long string of islands which has received waifs and strays from various quarters, the eastern ones, Timor, Timor Laut and presumably Wetter, chiefly from the Moluccas, New Guinea, and Australia, the western chiefly from Java. As the stream of Javanese immigrants, crossing narrow seas, is regular and unceasing, the species from that quarter have had fewer opportunities of differentiation, while the visitors from the eastward have for the opposite reason generally become distinct. This renders the fauna of the eastern islands more interesting to the naturalist, and Timor Laut, Wetter,* Sumba, and the high country of Timor, offer a field of unusual interest.

But Lombok Strait, now known in science as Wallace's Line, after the great naturalist who discovered its faunal importance, is nevertheless an important frontier, cutting off a host of Indo-Malayan forms† from Lombok and the islands eastward, and a few Austro-Malayan forms, such as the cockatoos, from Bali and Java. However, it seems hardly so deep as Mr. Wallace supposed,‡ and it is not impassable even to mammals, seeing that the tiger has of late years crossed it, and is now,

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tioned as common to the Indian and Australian regions, passing through these islands, but no doubt a few additional wide-ranging forms could be added.

Timor.

Peculiar species, ...	29
Extending to Flores only, ...	5
,, ,, Lombok only, ...	2
,, ,, Bali, ,, ...	2
Indo-Malayan, ...	13
Austro-Malayan, ...	3
	54

Lombok, Sambawa and Flores.

Peculiar species, ...	15	(Flores 4, Lombok 4, in common 7).
Extending to Timor only,...	7	
Indo-Malayan, ...	28	
Austro-Malayan, ...	0	
	50	

So that only seven species (or nine including the two extending to Bali) are confined to the group, as a group, and no Austro-Malayan species extends west of Timor, while the Indo-Malayan species are numerous.

Nothing whatever is known of the birds of Sumba.

* The island of Wetter seems to be wholly surrounded by deep sea, and merits examination.

† Such as the *Cyprinidæ*.

‡ The depth of Lombok Strait, as now given, seems hardly over fifty fathoms at the deepest part of the shortest line across it. There are several islands in the Strait.

I hear, making fearful ravages among the herds of ponies for which Lombok was once celebrated. As the dividing line between homologous species, Lombok Strait is probably less important than Ombai or even Sumba Straits. I should rather call it the boundary between the Indian Region and the neutral zone beyond, than that between the Indian and the Australian regions.

Sumba is one of the largest of the Lesser Sunda islands, having an area probably exceeding six thousand square miles, for the unexplored southern coast-line, drawn on the maps as concave, is really convex, giving great breadth to the island.* It is called Sumba or Humba (the S and H being interchangeable here and in Savu, which is generally called Hau by the natives) by all the tribes inhabiting it, but on the maps the more usual names are Chendana (Tjendana), Sandelhout and Sandalwood, names of the same significance, given not because, as has been stated, sandalwood is exported, but because that tree is said to be *tabu* (or *palili* as the Sumbanese say) to the inhabitants, so that if any one chances to break a twig of it, he is cut into small pieces, and scattered about under the sacred branches. At least, that is what the Malays say, but the Sumbanese, both the mountaineers and the coast-dwellers, entirely deny the existence of the tree on their island.

Deep sea separates Sumba from Flores, the high peaks of which are distinctly visible from Nangamesi Bay, but a bank covered by 50-80 fathoms of water, connects it with Eastern Sambawa, while on the side of Savu and Roti there is apparently deep sea again. No part of the coast has been surveyed even in the most cursory manner, but on account of the development of the horse-trade, the north-east coast from Laura to Réndi has become pretty well known to Arab and Bugis skippers. Except Tarimbang, which has not, I believe, been visited for generations, there is no harbour anywhere in the island. The roadstead of Waingapu or Wayapu, the chief port, is difficult of access, lying between two long coral reefs laid bare at low tide.

The aspect of the north coast of Sumba is most forbidding. Long naked headlands—Sasa, Ngarulubu, Mandolu, famous for their horses—extend far into the sea, marked with the lines of raised beaches. All this side of the island, for as much as forty miles inland and up to a height of two thousand feet, is covered with a sheet of coral overlying sandstone.† The coral must be of considerable age, and is often extraordinarily hard, reminding one of the ancient metamorphic lime-stones of Greece, in Bœotia and Arcadia. Its surface is infinitely rough and broken, capable of destroying the stoutest boots in a few days. It is owing to this that the Sandalwood ponies develop such hard hoofs that they rarely require to be shod. Fortunately, wherever the ground is level, the coral is hidden by a coating of indurated clay like laterite, and the native paths keep to this as much as possible. A scanty growth of grass, especially the horrible spear-grass, which renders travelling almost unendurable, covers the coral. Wherever the surface consists of irregular piles of jagged fragments, bristling with needle-like points, and full of deep rifts and well-like cavities, a dry, thorny jungle grows, since horses cannot find foothold there, nor fire reach it. The grass is burnt every May or June, and for some months later, the country is as black as a coal, but travelling is easier and is usually done at this season. In some places the soil is exceedingly rich, and the population dense, especially in Melolo and Laura; but the country is everywhere dreary, and is far from green even just after the rains. Nevertheless this region, the north-east coast from Laura to Réndi, is the civilized part of the island, and the seat of all the larger states. The coast itself is generally uninhabited for several miles inland, owing to the depredations of the Endinese pirates. The heat is terrible, but the coast seems singularly healthy, and the climate is more like that of Northern Australia than of the Indian Archipelago.

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* The southern coast of Sambawa is set down quite wrongly on the maps, as I could see from the top of Haruhasa.

† Near Kawangu the sandstone is uncovered, forming hills curiously carved and water-worn.

Till I came to Sumba, no European had ever visited the interior. Learning from the natives that a well-wooded and watered tract existed inland, I pushed across forty miles of a desolate coral wilderness and reached a wholly different country. At Pada Dalung, and thence to Mandas* (south-west) and Karita (south-east), and, I was told, to Tarimbang on the south coast, the rock is stratified and calcareous, apparently a soft decomposed chalk, and in one deep ravine I saw some huge round boulders which may have been granitic. The interior of the island is a great plateau, somewhat hollowed out in the middle by the river Kambéra, which rises in the forests around Léwa, and in that called Kétikujara or the Horse's Head, west of Mandas, flows eastward, and near Mandas is a considerable river in deep jungle, difficult to ford, haunted by crocodiles, and much larger in volume than at its mouth seventy or eighty miles below. Indeed most rivers of northern Sumba tend to disappear on approaching the coast. The table-land is flat in general outline, but deeply cut by an infinity of exceedingly steep ravines each with a clear swift stream. Flat or steep it is everywhere the richest possible meadow land. The forests lie in great masses, and, except

* Or Mandasu; spelt Maanalas in Mr. Roos's map of Sumba, which, except over a part of the north coast, seems to have been compiled wholly from hearsay.

at Tabundung and one or two other exceptional places, they are wholly trackless and serve as the boundaries of hostile tribes. West of Mandas, the country appears to descend steeply into the Indian Ocean. This slope was described to me as covered with high forest, with a heavy rainfall* and a coast so stormy as to be inaccessible during the greater part of the year. The height of the tableland of the Kambéra is usually about 1500-2000 feet; the hill at Pada Dalung must be about 2500 feet above the sea. The climate of this region is delicious. South-east and north-west the country rises, and by its upward trend conceals whatever high mountains may be in that direction. The great isolated *massif* of Tabundung, covered with high forest, lies south of Pada Dalung, and must be about 4000 feet high. East of this is the unknown *tana maringu* (cold country) of Masu, which lies back of Melolo, and is sacred ground. No war may be fought there, and the buffalo and horse have run wild, since those that escaped thither might not be caught and brought back. Masu is the Olympus of the Sumbanese, regarded as the original home of their ancestors, and the place whither their own souls shall go after death.†

West of Pada Dalung the country again rises, and beyond Léwa Paku (*Old* Léwa, the original demesne of the present king of Léwa, who now owns all the middle part of the interior plateau), and the sources of the Kambéra, lies another "cold country," probably of considerable height and extent. This is inhabited by rude mountain tribes, not yet visited either by Europeans or by the Arab and Bugis traders. West of Perwatana and Anakala, on the border of this region, which is called by the general name of Wayéwa, lies a great forest, and then comes Kodi, beyond which the land sinks precipitously into the sea near Gaura or Garu.

A volcano has been said to exist near Tarimbang on the south-western coast. But some people of that state told me this was quite untrue. However, the mountain of Tabundung, which I did not succeed in reaching, may possibly be of volcanic origin. This district, though rather out of the way, seems to be the best accessible collecting-ground on the island.

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* In Java and all the islands to the east of it, with the possible exception of Timor, the rainfall is far greatest on the southern and south-western sides. Thus at Tjilatjap (south coast of Java) the rainfall is 170 inches, at Surabaya 65. At Bima in Sambawa it is 38 inches. At Waingapu in Sumba it can hardly be more than 20, while at Pada Dalung it must be fully 100 inches.

† The Muhammadans of Sambawa, call their Heaven by the Sanskrit name *Sorga* (Swarga), and, I believe, say it lies in some distant mountains to the westward, perhaps a idea derived from the Hindus of Java. Hell is called Anaraka.

The upland forests of Sumba are less luxuriant than in Java or Sumatra, and are singularly free from thorns and underbrush, but many of the trees reach the height of a hundred feet, and some of the figs are of enormous girth. The only bamboos on the island occur in the dry valleys near the coast. Palms, except the *lontar* or palmyra, and a few arecas, are exceedingly scarce. The Endinese, who import cocoa-nuts, always destroy the germ of each nut, which perhaps accounts for the absence of this useful tree.

Of the animals of Sumba I can say but little. The natives think there are three kinds of monkeys, but I saw only the *Macacus cynomolgus*, which is very common and tame. A deer like the *Cervus muntjac* is said to be common, as well as another with large branching horns, which they call by the Malay name of *rusa*. Wild pigs abound, and a wild cat. Among birds, cockatoos are so numerous that I have seen the trees white with them; the species is the common lemon-crested one.

Among domestic animals there are pigs (*wei* or *wawi*), goats, fowls (*manu*, a Javanese word), a few buffaloes (*kalambua*, a softened form of the Malay *kribau*), cats (*kamembu*), dogs (*ashu*), and pigeons. Buffaloes are used chiefly for ploughing and for funeral sacrifices. They are the largest animals of which the Sumbanese have any conception, and a huge, ferocious kangaroo-hound, who goes about with the king of Léwa as a very efficient body-guard, has been called by the awe-struck natives the "Roaring Buffalo." Fowls are used chiefly in taking auspices, and pigs and mares are the animals generally employed for food.

Horses are the most valuable product of the island, and "Sandal-wood ponies" are perhaps the best in the world, and well known as far as Rangoon and Hong Kong. They are called *jara*, a word which, like the Malay *kuda*, is derived from the Sanskrit *ghora*. The horses live unguarded in troops of twenty or thirty, each having its own range of pasture, the limits of which are carefully respected. Being very curious, they used to follow me for miles over all obstacles, but never dared to cross the ravine which bounded their beat. The colts generally follow the leading stallion (and not their dams) in a long string, which has a most absurd appearance. The mares are rarely ridden, and as in Sambawa are kept for breeding and for food.* Only stallions are exported. The trade is wholly in the hands of the Arabs and Bugis, who carry the horses to Surabaya in their own vessels at a fixed time every spring. The Sumbanese are the best rough-country riders I have ever seen, (and I have lived among the Turkman, Bedawin and Iliats), galloping bare back down the steepest slopes. On foot they are a singularly helpless people, and would rather ride twenty miles than walk one. They are fond of their horses and give them the most ornate names, those of mine being interpreted to me as "Beautiful Flower," "Wind in the Grass," and "Lightning." No woman is allowed to mount a horse, and I have seen a princess on foot while her attendant slaves were mounted.

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* In Sambawa, though the people are Muhammadans, a man is allowed to kill a mare on his birthday and make a feast for his friends. This is also done at the end of Ramazan; and even the Imams do it, though they may have made the Mecca pilgrimage. The Do Donggo sacrifice mares at the time of the rice-harvest.

The staple food in Sumba is millet (*usukanu* or *uhukanu*) and maize,* generally planted alternately, and rice (*usuberesu* or white grain), which is hard to obtain except on the coast. The wet cultivation of paddy is unknown,† though the late king of Taimanu tried to introduce it at Yawahapi-Lukukatoba. Maize is usually eaten parched. Meat is only eaten on great occasions, and there are scarcely any vegetables. Curiously enough, the use of toddy (palm-wine) is unknown, though so common in Flores, Savu, and Roti, and even in the Muhammadan parts of the Celebes. Considering the wealth of the people, and the cheapness of Java rum, the Sumbanese are a sober people, and most of the mountaineers have never tasted spirits. The use of betel is universal. Salt is very scarce and dear.

The people of Sumba do not probably number less than 100,000, and perhaps much more if Laura and Melolo are really as populous as they are said to be. A small colony of curly-haired Savu people are settled at Waingapu and Kabaniru, and a similar race at Memboro. Some of the Melolo people are said to resemble the Rotinese in feature. Otherwise, the bulk of the people may be said to be Mongolians resembling the Javanese, with a Polynesian aristocracy.‡ The former are the same as everywhere. The latter are tall, light-brown men, of somewhat slender, but graceful and manly proportions. The face is rather long, with a Roman nose and a finely-moulded chin; the hair is straight, rather dry and stiff, and a beard is not generally worn. The women are often of a refined and high-bred, though somewhat grave and melancholy beauty, contrasting strangely with their barbarous condition. The quiet dignity of the men is in striking opposition to the innate vulgarity of all Mongolians from Turcomania to Malayana.

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* Maize is probably a recent introduction, but I could hear of no tradition on the subject. A common species of sorghum growing in marshes is called "wild maize." In many of the islands, the word *jawa* or Javanese is applied to maize, showing whence it came. In Sumba the word is *water*, but in Savu *water-jawa*, in Roti *mbēla*, in Timor *pēla*, in the Moluccas *milu*, in Endo (Flores) simply *jawa*, in Roka (Flores) *hai*, in Sambawa *baso*. The word *jawa* is applied to anything foreign. Europeans are called "white Javanese," and I was generally known in Sumba as *umbu maremba jawa* or the King's son from Java.

† The Do Donggo of the mountains of Sambawa have some of the finest wet paddy fields I have ever seen. Yet they are far inferior in capacity to the Sumbanese, and preserve a curious memento of their recent savage state in an annual three days' pilgrimage to the mountain-tops, where they sleep in the open and live wholly on what game they kill, leaving the villages guarded by the dogs tied up in the houses.

‡ Some of the western hill-tribes may belong to a lower race. The Kodi people are said to be of short stature, and to turn the toes inwards in walking, especially the women. To "walk like a Kodi woman" is a staple joke, appealing strongly to the Sumbanese sense of humour.

The Sumbanese, both men and women, wear a large loose mantle of Manchester cotton dyed black in the mud of the rivers. The women wear also a short black skirt, and on gala occasions a black jacket tastefully embroidered with beads and small cowries. The men wear a waistcloth, a turban, a huge ivory armlet, and a heavy belt like that worn by the Greeks and Albanians, containing their krisses and *parang*. They always go about with a square mat-work satchel, generally of very pretty design, containing betel. They exchange betel with everyone they meet outside their village, as a sign of peaceful intentions. I had to carry a supply about also, and never dared to decline it, though it is not at all nice, for the Sumbanese could only explain a refusal as a sign of hostility, just as Bedawin would excite at the refusal of salt. Bows are unknown in Sumba, and so are fire-arms, but a man goes nowhere without two spears, which are never laid aside for an instant. In the remote district of Mandas, I was amused to see that my visitors had covered their spearheads with sheaths tied on with thongs, as if to reassure me, reminding me of the old Norse custom.

> "Thereat was the Wrath of Sigurd laid fast in a silver sheath.
> And the peace-strings knit about it, for the blade was fain of death,
> And 'tis ill to show such edges to the broad blue light of day,
> Or to let the hall-glare light them, if ye list not play the play."

The Kambéra language is understood over the greater part of the island, but Gaura and Laura in the west have languages of their own, and the Memboro dialect is very distinct. All these are closely allied to the Javanese and the languages of Sambawa and Flores. I have taken vocabularies of a number of these, which I hope to publish some day.

Strange to say, Sumba has a currency of its own in the shape of fine copper wire very intricately plaited and cut into lengths of two feet, worth half a rupee each. The ugly, fish-shaped earrings of gold beaten out thin, are always of the same size and value (about a dollar), and are likewise used for money.

The women have spinning-wheels and weaving-frames, and make cloth, especially blankets, generally white with curious figures of fish, tortoises, prawns, ships, men, deer, etc., but all so conventional in form and so harmoniously arranged that the effect is good. The men also make nets and ropes, both of excellent quality and largely exported, and at Kadungu (Memboro) good pottery is made. The chief exports are horses, slaves and edible birds-nests.

There are three castes of Sumbanese, the *maremba* or lords, the *kabisu* or freeborn citizens, and the *towata* or slaves, the latter being the most numerous.

The ruling classes marry chiefly among themselves, and are interrelated in a most puzzling fashion. Marriages are arranged by the parents, and are of two kinds. If the wife is bought, whether with money or with service, she enters her husband's tribe. In this case she is his property, and he can kill her if he likes. If he pays nothing, he enters her tribe; but this is less usual. Polygamy is not common, but if a man's sisters-in-law remain unmarried, I believe they are after a time considered as his wives. The Sumba women make faithful wives, but before marriage incontinence is universal, and every girl, slave or princess, has her price. Infanticide and abortion are very common, and it is probably largely for this reason that the population is not increasing. Islam always, and Christianity often check this evil, so that the population is large and increasing in Muhammadan Ende and Sambawa, and again in Christian Roti and Solor. The old are treated with great respect. The Sumbanese struck me as a brave, honest and truthful people. But they are too proud to work for others, and will never become a thriving agricultural race like the Javanese.

Exogamy is usual, and the rules of intermarriage are often inconveniently complicated. For instance, I hear that Kanata men can marry only Lakoka women, and Lakoka men only Soru women. Now Lakoka* and Soru are small independent states in the interior, while Kanata (or Lubu) is fifty miles away on the coast of the Taimanu state.

Apart from the wars of extermination waged now and then by the great chiefs, disputes are continually going on between neighbouring tribes, generally concerning boundaries, horses, or women. They are usually settled without much bloodshed in the following manner. The men meet in a meadow, and form two lines on horseback. Then the chiefs recite war-songs, and make speeches, and the two sides exchange abuse and defiances in the Homeric fashion, till the proper degree of excitement is reached, upon which they charge, fighting with spears and shields. As soon as anyone gets speared, his side acknowledges itself beaten and pays a fine, while the others celebrate their victory with much noise and feasting. The horses on these occasions are decorated with collars of white horse-hair, and immense frontal tufts, giving them a most ferocious look, and are said to enjoy the fighting thoroughly. Sham fights, very similar to the real ones, and quite as dangerous, are often held. But horse-fights are the characteristic amusement of Sumba. Two stallions and a mare are placed in a little enclosure, and the former fight till one is dead. On great occasions there is dancing, generally performed by women, and sometimes a poet will sing the praise of his forefathers, exhibiting the skulls of their conquered enemies which have descended to him. The musical instruments in use are drums, gongs, and a guitar with two copper strings.

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* In 1886, shortly before my visit, the king of Léwa sacked Lakoka, in alliance with the Ende slavers. The men were killed, the king took the horses, and the women and children were carried off to Flores as slaves. This is the usual way in which the Endinese do business. It is to be hoped that the Dutch troops now in Flores will put an end to this murderous little state. Its supremacy in this region is owing to its possession of ships and rifles, of which the Sumbanese have none.

The dead are buried,* household articles being broken and thrown into the grave as in the Nicobars. A large oval horizontal slab of stone surrounded by small upright ones, marks the grave. The bodies of chiefs are exposed on the mountains for months after their death. When a propitious time for the funeral comes, a great feast is held, many buffaloes, pigs and mares are killed and eaten, and a number of slaves, both men and women, are strangled and thrown into the grave.† When I was in Sumba, the body of the late king of Taimanu had been lying exposed at Semparingu for more than a year.

I cannot say much about the religion of Sumba. The island presents a remarkable contrast to Sambawa in this respect. In Sumba, though there are a few *ratus* or professional magicians of little influence, the chiefs are the real religious leaders, and it seems to me that the union of church and state in the hands of practical men managing large temporal affairs has kept superstition in bounds. In Sambawa, both in the heathen and in the Muhammadan parts, the *juhis* or sorcerers are the descendants of the old local chiefs, now replaced by a centralized bureaucracy. Reduced to mere tricksters and jugglers dependent for their food on the popular faith in their magic powers, they have made the people as superstitious as any in the world. The same is the case with the heathen Do Donggo. Here the sorcerers hold a higher rank as *juhi Perafu* or priests of the god Perafu. But all temporal power is in the hands of the *glarangs* or headmen. The result is, that the *mori*, or ancestral spirits, and the *héncha*, or demons, are never out of peoples' minds, everything seen or done has some good or evil significance, there are sacred trees, mountains, springs, stones, and animals, while every spot is the scene of some absurd legend. Each village has its priest's house, priestess's house, and its *uma Perafu* or house of Perafu, closed, empty and of very archaic make. Belief in the evil eye, in the unluckiness of a thousand acts and signs, in the constant presence of evil demons, and in the disastrous effect of anything unusual or uncustomary, make these people the timid, unhappy race they are.*

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* The Do Donggo in Sumbawa are buried sitting, but I can find no note of the Sumbanese custom.

† On the death of a Sultan of Mbojo (Bima) in Sambawa, 199 buffaloes are sacrificed. A new flagstaff is raised by his successor, and a slave is said to be strangled and buried beneath it. This, if true, illustrates the extreme conservatism of the East, for the people of Bima may be almost called a civilized race, and have been Muhammadans for some centuries.

The Sumbanese are said to worship one greater god, described as *umbu walu mendoku* or *he who makes all*, who owns all the sandalwood. Also two deities called *umbu awan*, lord of heaven, and *umbu tana*, lord of earth, to whom worship is paid at harvest time, and rice, pigs, horses and buffaloes sacrificed. They also believe in evil spirits, and the huge fig trees in some of the villages are apparently held in veneration. Certain things also are sacred, and hence *tabu* or forbidden *(palili* in Sumba, *léo* or *pomali* in Timor, *perafu* among the heathen of Sambawa). Though the crocodiles receive no regular ceremonial worship as in Roti,† the Sumbanese nevertheless throw them meat, saying, "Don't eat me, but eat such a man, my enemy." But the chief Sumbanese deity is Merapu (the name is obviously equivalent to the Sambawan Perafu), who is the hearth-god, a kind of aggregation, I imagine, of the ancestral spirits. But some say he is a man who lives in Masu, and is a kind of intercessor with the great gods for men, and especially for kings. He is described as black in hue, for when I asked why the Sumbanese dressed wholly in black, they replied that it was Merapu's colour. The largest insect in the island, the black butterfly I have named *Papilio merapu*, is sacred to him. They pray to him in the forest, placing betel, siri, and a bit of gold or silver on a leaf, and setting it on the ground say "Merapu, give me this and that, pasturage for my horses, rain for my maize, and vengeance for my wrongs." Slaves pray to Merapu that the king may live a hundred (*ngasu*) years, for they are afraid of being sacrificed at his death.

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* For instance, when I was at Kala in the Donggo country, the *juhis* kept praying and sacrificing all night to prevent evil resulting from my stay there. At Pelunto the people threatened to abandon their homes when they heard I was going to climb Haruhasa, the chief mountain in those parts. And when I returned and nothing happened, they said I had not really done it, just as when the alpinist climbed Ararat, the Armenians would not believe it, because he had not seen the Ark standing intact on the summit, as St. Mesrob had seen it in his dream. At Oo, the juhi declared that my visit had caused the terrible rains we had then. Out of revenge I rolled my eyes at him tragically, and repeated the first stanza of "Simple Simon met a Pieman" once or twice when I met him, upon which he fled the country. Such things are quite impossible in Sumba, and their own little devices for keeping off the evil spirits are performed in rather a sceptical mood. As in India they snap their fingers when some one sneezes. If a young man hiccups, they box his ears, if an old man, they ask him respectfully why he did it, to which he calmly replies that he never did, and there is a general smile.

† The following story was told me by Mijnheer Teffer, whose wife, a remarkably beautiful woman, now a Christian, was the daughter of the king of Hai in Roti. There is a caste of priests of the crocodile there. When they want to travel by water they call the crocodile, and he carries them wherever they wish on his back. On a certain day they go down to the bank, and call the crocodile, describing to him their rank and duties. When he comes out, they take him up and carry him, with a band of music and an applauding crowd, to his temple. There they give him rice and sweetmeats, put a robe on him, and begin praying over him. He dislikes the praying

The houses are large, with a thatched roof pointed at the top, and a floor raised five or six feet above the ground. Inside, the fireplace is always surrounded by four posts. That on the right hand on entering is called Merapu's post, and the enclosure is sacred to the god. Oaths are taken by laying the hand on this post, and no one is allowed to sing or play the guitar indoors when a fire is on the hearth.

Houses are gathered in a *paraing* (generally called *paré*) or village, or in a *negeri* (Sanskrit, through the Javanese) or town. The political unit, at least in the interior, is a group of open villages, protected by a fortress (*kota*, Sanskrit through the Javanese). Thus Watupéli is the central fortress of Melolo, Kamanu of Mandas, and Lambanapu of Kambéra. On the plains, these fortresses are defended by intricate cactus hedges, but I was told that in Laura (I think) towns are strongly walled with stone, as is the case with some of the hill forts elsewhere. These last are often very striking. Lateng in the Taimanu state, is built on a sharp spur of the mountains, the *col* connecting it with the main mass fortified by wall after wall. On the other side, the hill descends at a very steep angle to the river a thousand feet below, and this almost inaccessible gorge is so industriously cultivated as to be a perfect nest of verdure in this dreary country. In times of peace these forts are often left almost unguarded. Once I lost my way at nightfall in the Kiritana district, but when the moon rose I struck a path, and rode through a country of alternate thorny jungle, and meadows studded with great upright blocks of coral-like tombstones,

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and struggles, so that it is necessary to quiet him with more food, and begin the prayers again. When the prayers are said, they carry him back to the river with music and dancing, and when he enters the water all the other crocodiles rise up and pay homage to him as their king.

worn into a thousand fantastic shapes like Gothic gurgoyles. The impressive uncanniness of this place I cannot describe; my horse was in an agony of terror. Finally I came to a citadel on a steep crag, and climbing the wall in constant expectation of attack, I found a mass of huge fortress-like houses of stone, bigger than any built nowadays. After I had gone over most of them and found them full of grain and household utensils, but without inhabitants, I finally stumbled on three very old men, who were speechless with amazement at seeing me. They were in charge of the place and had not had a visitor for months.

The little district with its sheltering citadel was probably till modern times the only kind of state in Sumba. The recent evolution of governments like Léwa and Melolo has as yet had but little influence on the people of the interior.

On the coast, one can now ride from Waingapu to Melolo without receiving anything from the men he meets but polite salutations. In the interior, even in the middle of the Léwa dominions, I never met a native not belonging to the village where I was staying, but we both prepared for battle, and spear and revolver were held in readiness till we had exchanged betel. Twice I was within an ace of being speared, because I came on men suddenly in the forest. When two parties meet, they halt when yet a long way apart, dismount, and drive their spears deep into the earth as a sign of peace, then exchange a "cooey" (the well-known Australian cry, much used in Sumba), and yell out a question or two. Then two men advance, one from each party, and exchange betel, after which the others come forward warily, keeping a good grip on spear and shield. In spite of the tyranny of the kings over their subjects, and their occasional ferocity to conquered enemies, centralized government of any kind is better than this constant distrust of one's neighbours. The northern kings of Sumba have greatly strengthened their power by making it hereditary. The *umbu maremba*, or heir-apparent, is a power even in his father's lifetime. Whereas in Ende, Roti, Savu, and in the less advanced states of Sumba, the king's successor is elected by the nobles from the royal house.

The most powerful of the Sumba kings are those of Léwa (who holds Kambéra by right of conquest), and Melolo (who ruled half the island a generation ago), whose son rules at Petawang. West of Léwa come Taimanu, Kapundu, Palmédo, Kadungu (or Memboro), and finally Laura, which is said to be of great interest, but which has not been visited by any European. The Dutch claim allegiance from the Savu and Timorese immigrants at Waingapu and Kabaniru as well as over a few Arabs, Bugis, and Chinese who trade at Waingapu. But these all pay tribute to the king of Léwa, and the only time they refused it, he plundered the village, and drove the Dutch agent out of Sumba. When the unhappy Achinese war is over, it is to be hoped that the Dutch will pay some attention to this fine island, hitherto neglected. Owing to the absence of fire-arms, it could be subjugated by an insignificant force; the horse-trade properly developed would prove a mine of wealth; and under settled government the island would be as prosperous as Roti or the Minahasa. However it may have been in the last century, no people in this can rule semibarbarous races better than the Dutch—when they think it worth their while.

Some idea of a Sumbanese king may be gathered from an account of my visit to Tunggu, king of Léwa, which I made with my kind friend Mr. K. H. de Roo van Alderwereld. The king was then at Kawangu near the coast.

We rode from Waingapu across the Matawai, past the Savu settlement of Kabaniru, and reached the Kambéra river, where women were dyeing cloth in the black mud, and a frizzly-haired Timorese was fishing in a canoe. Fording the Kambéra and the Palamenjéli with much difficulty, we reached Kawangu, a village of thirty large houses. A narrow path wound zigzag past three great concentric hedges of cactus guarding the place, and brought us to the king's house. He was an ugly old man, well over six feet high, wearing nothing but a dirty waist-cloth, his skinny limbs uncovered. His long hair was white and knotted over the nape of his neck, his eyebrows were black and stood out from his head, the hairs more than an inch long, shading a pair of singularly bright, unsteady eyes, and giving him an extraordinary appearance. He shook hands with us feebly with his paralyzed left hand, holding his spear in his right all ready for action, for he is forever suspecting some treachery. He had two mares led up, and drove his spear into the throat of each with a wild shout; then he killed a pig for us, saying, politely, "Pork is for kings' sons, but mares' meat is good enough for soldiers." For the mares' meat was for his bodyguard, a number of handsome and splendidly-formed young men, with whom he was at that time hoping to conquer the whole island. Later on, we saw him standing among them ladling the boiling meat out of a huge pot, and saying, according to our interpreter, "Eat, my children; he who fights shall eat meat; let slaves stick to millet."

He took us to see his elder brother, who was slowly dying of cancer, and had therefore given up the throne to him many years before. When my trip into the interior was suggested, he coolly made a counter-proposal that we should both go and help him in his campaign against Anakala. For he has no fire-arms, and no doubt thought a rifle or two would have great effect on those sturdy mountaineers. On our declining this, he invited the leading nobles into the council-house and consulted the auguries about my journey, examining the liver of one fowl after another till one suited him. Every stain or flaw in the liver has its own meaning, and I was surprised at the acuteness of his inferences regarding them. Sometimes he would consult some of the old men, who seemed quite familiar with the science, and evidently considered it as reasonable and reliable as the multiplication table. The king is held the best haruspex in the country, and is also proud of his skill in causing rain or drought. He remarked incidentally that he would give me good weather for my trip. We sat up till late listening to a minstrel singing a song of the king's composition, twangling a guitar the while. The king sat glancing sharply at us alternately, some nervous affection keeping his head and hands in constant motion. Meanwhile his followers sat in a circle round him, looking singularly dignified and austere. They wore black mantles and turbans, their belts were full of handsomely-mounted weapons, their fine Roman faces perfectly quiet, in striking contrast to their master's, whom they so surpassed in dress and bearing. Still I think I understood then somewhat of the power which made this ignorant savage a ruler of men, personally more reverenced than any sovereign in civilized countries.

The butterflies mentioned in the following list were taken in 1887. The Sambawan specimens are in the hands of Mr. B. Neumoegen. The Sumba ones have remained four years in my possession, during the course of which most of them have suffered greatly, and many of the best have disappeared or been destroyed, including several uniques, of which I have only descriptions made at the time. As, however, no one may visit the interior of Sumba again for many years to come, I shall include these descriptions here. Owing to my small knowledge of Moluccan and Timorese butterflies, and the absence of specimens for comparison, my work is necessarily imperfect. When described, the Sumba butterflies will be sent to M. Charles Oberthür. Of the Sambawa butterflies I cannot give a complete list, and I am obliged to omit most of the *Euplœas* and some others. At the time I was there, I counted about 140 species taken in each island. In this list I number only the Sumba species, those from Sambawa being introduced chiefly to illustrate the geographical distribution of the species, and to describe a few novelties.

There is a considerable Austro-Malayan element in the Sumba butterflies, but very few of these forms reappear in Sumbawa, *Ornithoptera naias* and *Danais (Nasuma) haruhasa* being the most remarkable of those that do. The list scarcely does justice to this element in

Sumba, since a *Doleschallia* and a *Charaxes* probably of Moluccan type escaped me, and of a *Hypolimnas* apparantly near *H. pandarus* I made no description, and the specimens are lost.

A few Papuan or Timorese forms occurring in Sumba do not extend to Sambawa, such as *Radena oberthurii*, and the above-mentioned *Doleschallia* and *Hypolimnas*. In one or two cases a species occurring with little change from Java to Timor has a wholly different representative in Sumba, as in the case of *Papilio maremba*. Ten Sumbanese forms are represented in Sambawa by other allied species, namely, six *Danaidæ*, three *Pieridæ* and a *Papilio*. Nine species of *Danais* occur in Sumba and nine in Sambawa, and of these six are the same, and three different. Ten species of *Euplœa* (of nine different groups) were taken in Sambawa, and only six in Sumba (perhaps on account of the continual rain in the interior), of these only one, a large *Salpinx*, was common to the two islands. The dominant *Euplœa* of Sumba was apparently *E. lewa*, that of Sambawa seemed to be the Javanese *E. (Selinda) eleusina*, and both have their mimics. *Trepsichrois*, of which a species is peculiar to each island, appears as a mimic, and rare, whereas further west it is usually a dominant genus.

Information regarding the seasonal forms of the *Satyridæ*, will be found under the head of that family. It will be seen that in these islands the non-ocellate brood appears when the ocellate brood appears in India, as might be expected, the seasons there being similarly reversed. In Sambawa I reared both forms of *Melanitis leda* from the wet-season one, by keeping a wet sponge along with the chrysalids in one box, whence only the ocellate brood was obtained.

My discovery of the dimorphism of these insects, made in 1882-3, and my theory regarding its cause, have now received confirmation from all sides, and may be regarded as proven.

My collecting in Sambawa was in the eastern part of the island in the sultanate of Bima or Mbojo, and was unfortunate, owing to the heavy and unseasonable rains. Owing to the assistance of Mijnheer A. C. de Heer, Controleur of Bima, for whose kindness I offer my best thanks, I was enabled to visit the mountains west of Bima, the Sultan sending his brothers to arrange matters for me. These mountains, which are of some height—two of the peaks, Haruhasa and Ndindi exceeding five thousand feet in elevation—are in the district of Bolo, the capital of which is Sila, and are inhabited by a timid race called the Do Donggo Bolo to distinguish them from the Do Donggo Kai near Prado. The higher parts of the mountains have a very wet climate, and are partly meadow and partly forest. The latter is exceedingly rich and luxuriant, resembling that of Sumatra or Borneo, but is of no great height on account of the violence of the wind.

My impression is, though I can scarcely prove it by lists of species, that the insects of this mountain region, are almost purely Indo-Malayan, or at least more so than those of the coasts. If this is true, it does not at all agree with Mr. Wallace's belief that the Indo-Malayan element is of recent introduction. As these mountains are very easy of access from Bima, where steamers stop every month, and as travelling in the island of Sambawa is safe and pleasant, it seems a pity that some competent ornithologist does not investigate the birds of this district, which ought to afford many novelties.

Family DANAIDÆ.

1. SALPINX MEIZON, n. sp.

Male, above, forewing rich brown with blue reflections, a short slender pale lilac spot in the interno-median space, a costal spot and seven large inner-submarginal ones, light blue with purple reflections, generally pointed outwardly and inwardly, the second largest, separated only by a vein from the first, which is prolonged costally, the last with an obscure streak below it. Hindwing with the blue gloss much less conspicuous, the velvety patch pale ochreous externally, darker internally; two or three small subapical lilac spots. *Below* dark brown, both wings with the cell and the spaces just beyond it much paler than the outer part. Forewing with a costal lilac dot, and sometimes one or two subapical, a larger one in the lower median space; below the lower median vein a large ochreous area, pale brown in the middle, extending below the submedian vein, enclosing a short sericeous band. Hindwing with a varying number of minute inner-submarginal lilac spots subapically, and sometimes two or three still smaller outer-submarginal ones subanally.

The basal tuft of the male is very large, light reddish at base, fuscous outwardly; the outer tuft white, very short.

Expanse of male over four inches, the female still larger. Type from Sumba, where it is scarce, also occurring in Sambawa, apparently unchanged. It differs from *S. leucostictos* and *pasithea* in the pale internal areas of the underside, and in the absence of most of the submarginal spots. It somewhat resembles *S. viola*, Butler, from the Celebes, but lacks the blue spots on the hindwing above.

SALPINX (SELINDA) ELEUSINA, Cramer.

Sambawa, very common. An undescribed *Isamia* occurs in Sambawa.

2. SALPINX (CALLIPLŒA) SUMBANA, n. sp.

Above, forewing brown, slightly glossed with blue, the outer margin paler; a costal white spot, and a submarginal row of nine others, the first six more or less fused into a single mass, the first and sixth sometimes separate, the veins dark, the fourth (above the upper radial vein) much the largest, the seventh and eighth (between the median branches) minute. Hindwing whitish costally, unmarked. *Below* uniform brown, forewing with the spots reduced, those between the median veins generally absent. Hindwing with 4-6 small inner-submarginal spots subapically, the last minute.

Sumba, coast and interior. It seems quite distinct.

SALPINX (CALLIPLŒA) SAMBAVANA, n. sp.

Above, forewing with seven large lilac spots centred with white, the second and last largest, the upper ones sometimes slightly connected, Hindwing with several lilac spots subapically. *Below* both wings with two nearly complete submarginal series of small and delicate white spots, the outer ones minute and not extending to the apex.

Sambawa, one of the numerous local forms of this group. A very distinct species, *C. hyems*, Butler, occurs in Timor.

I have noticed that both *C. sumbana* and *C. sambavana* are occasionally found with the first subcostal vein united to the costal one, showing at the same time the relations this group has with *Hestia*, and the small value of classifications based wholly in venation.

3. STICTOPLŒA MELOLO, n. sp.

Male, above rich dark brown, with blue reflections over all the forewing except the extreme outer margin; four lilac spots, sometimes centred with white, form a narrow subapical mass, the fourth well separated, generally a fifth below it, and occasionally a sixth. In the male the sex marks vary; in the specimen before me, the upper one is shorter than the lower, and only half as broad. Hindwing with two, sometimes three, subapical spots. *Below* rich brown, darker at the end of the cell and on the disc beyond it; a distinct white spot bordered with lilac at the end of the cell, and two near it in the median spaces; generally traces of a few other dots, especially subapically on the hindwing. The semicircle of spots beyond the cell of the hindwing is represented by obscure darker touches. The female is much paler.

Sumba, common; one of the numerous local forms of this genus.

4. STICTOPLŒA LACORDAIREI, Moore.

Sumba, common. The species was described from Java.

EUPLŒA (TREPSICHROIS) DONGO, n. sp.

Male, above, forewing outwardly shining blue, basally blue-black, with two rows of pale blue submarginal spots, the outer of about eight or nine dots, not extending above the radial veins, the inner of seven large spots placed irregularly, the first four and the last three in line, the first minute. Hindwing bronzy brown with a slight bluish lustre subapically, the velvety area extending below the upper median vein. *Below* chocolate-brown, forewing with a purple cell-spot, a costal and usually three or four minute discal spots, and one or two submarginal dots near the lower angle. Hindwing with a large paler area subapically around the subcostal branches; usually a few submarginal bluish dots. The wings are short and broad, quite unlike those of *T. midamus.*

Female with no trace of blue. Above, forewing with whitish markings, one geminate in the cell, (besides a basal pale streak there), one costal, two approximate beyond the cell, three discal, two outer-discal spots, besides a few pale ones subapically and an interno-median pale streak. Hindwing with the white rays larger and more distinct than in *T. midamus,* the submarginal spots obscure. *Below,* all the markings are white and well-defined.

Nearest *T. mindanaensis,* Semper, from the Philippines, but the female and the underside of the male are very different.

Taken sparsely in the mountains of Sambawa, in the Donggo country.

5. EUPLŒA (TREPSICHROIS) ELWESII, n. sp. Pl. II, fig. 1.

Female, above brown without any blue reflections, a pale longitudinal streak in the cell, a small round whitish spot at its end, two similar discal spots between the median branches, a long bent pale streak in the upper part of the interno-median space, a subapical area of five large white spots, separated by veins only, from the costa to the upper median vein, the lower spot large and quadrate. Hindwing with four white streaks occupying the greater part of the cell, two good-sized elongate quadrate markings at the base of the spaces between the upper subcostal and the radial vein, small spots beyond the cell below the radial vein, and above the lower median, narrow whitish streaks in the submedian space, and two in the internal space. *Below,* there are obscure subapical dots on both wings, and a few marginal ones nearly obsolete. The white masses of the forewing and the hindwing are unchanged.

This species, the most aberrant of the genus, obviously mimics *Radena oberthurii,* a dominant species in Sumba. No male was seen, and only two females, both now in bad condition, were taken at Koloki and Mandas, Central Sumba, 2—3000 ft.

I name this butterfly after Mr. H. J. Elwes, the well-known lepidopterist and ornithologist.

6. EUPLŒA (RASUMA ?) LEWA, n. sp. Pl. II, fig. 2.

Male, above, forewing dark brown, the outer part paler, especially near the lower angle; a broad sericeous streak in the interno-median space, nearly half an inch long; a subapical mass of four blue-bordered white spots, with a minute one above them, the first two small, the third large and quadrate, the fourth smaller, pointed inwardly; a whitish point on the costa, another obsolescent discally in the upper median space. Hindwing unmarked, much paler than the forewing, especially outwardly. *Below*, forewing darkest on the disc and in the cell, the subapical band somewhat reduced in size, one bluish spot in the cell, one near the costa, and three on the disc, the lower one yellowish. Hindwing, with a space above the terminal part of the cell much darker than the rest, a pale band round the disc, one bluish spot in the cell, five or six dots beyond it, and eight rosy ones in an irregular line across the disc, two in each median and in the lower radial space, and one in each of the two next spaces. Expanse over three inches.

Sumba, apparently a dominant species. Like the next species it is separated from all allies by its white subapical band.

I did not find any species resembling this in Sambawa, though a species of *Penoa* occurs there having a somewhat similar sericeous brand above. I took only a single male at 2000 feet. A wholly different species, *G. baudiniana*, Godart (*orope*, Boisduval), occurs in Timor, having the hindwing broadly whitish. *E. lewa* is apparently of Papuan affinities.

7. EUPLŒA (CRASTIA OR VADEBRA) PALMEDO, n. sp. Pl. II, fig. 3.

Closely resembling the preceding species. Male, forewing dark brown above, paler outwardly; a white, rather quadrate, subapical mass diffused at the edges, broken by three slender dark veins. Hindwing nearly white above the upper subcostal vein, the rest brown, the outer discal and subanal area much paler. *Below*, the pale areas are more obvious than in *Euplœa lewa*. Forewing with a bluish-white spot in the cell, and two in the disc beyond, besides traces of two streaks in the interno-median space. Hindwing with one spot in the cell, a semicircle of six minute ones beyond it, and a row of seven or eight larger ones in the yellowish discal area, all but one arranged linearly; only one or two submarginal dots visible.

Sumba, coast and interior. It is much less common than *E. lewa*, but as the *climena* group to which it belongs is in most places a dominant one, I am unwilling to believe it a mimic of that species. The species is a very distinct one.

An allied form occurs in Sambawa, with the margins broadly whitish as in *E. climena*, and without the conspicuous subapical white band of the forewing.

EUPLŒA (CRASTIA ?) DEHEERII, n. sp.

Male, above dark brown, with a slight violet gloss, the outer margin broadly paler, not glossed. Forewing with an irregular series of seven small white outer-discal spots, the first three subapical, cordate, separated by veins, the fourth and fifth beyond the line of the others, the fifth minute, the sixth and seventh in the median spaces, distinct, equal, the upper elongate; an obscure dot near the base of the upper median space. Hindwing with three good-sized white subapical inner-submarginal spots, and eight or nine obscure outer-submarginal dots, which do not reach the apex. *Below*, the cell and inner part of the disc of both wings dark brown, the rest paler, with a bronzy gloss. Forewing with a spot in the cell, one costal, four or five discal violet-white spots, seven inner-submarginal white ones arranged as above, and eight or nine outer-submarginal ones minute. Hindwing with a cell-spot, a semicircle of seven inner-discal violet-white spots, and one of nine or ten outer-discal ones, mostly white, some lilac; about twelve small submarginal white spots, larger than those on the forewing.

Like my *Euplœa oceanis* from Engano, this species has a large, somewhat velvety, pale brown patch on the underside of the forewing. This lies along the internal vein for more than half its length, about three quarters of it lying above that vein. At the base of this there is an obscure whitish patch, chiefly below the internal vein, while parallel with it is an obscure longitudinal sericeous streak placed below the lower median vein. The hindwing is whitish apically and costally, with a pale brown area surrounding the subcostal veins, entering the cell and the space below the costal vein, extending narrowly along the subcostal veins three-quarters towards the margin.

The species perhaps belongs to Mr. Moore's genus *Gamatoba*. I took it in the mountains of Sambawa, and name it in honour of my friend Heer A. C. de Heer, Controleur of Bima.

Another species from Sambawa, belonged, I think, to the subgenus *Tronga*, making ten *Euplœas* in all from that island, some very rare. Only six were taken in Sumba. At a favourable season, I believe Sumba will yield a far larger number of species than I obtained there.

8. DANAIS (LIMNAS) CHRYSIPPUS, Linn.

Sumba, Sambawa. Somewhat intermediate between typical *chrysippus* and *D. bataviana*; colour bright red as in *chrysippus*, the white spot at the end of the cell absent, the black border of the hindwing broader than in Indian specimens, and inwardly diffused.

9. Danais (Salatura) genutia, Cramer.

Sumba, Sambawa. My Sumba specimens are somewhat intermediate between *genutia* and the Javanese *D. intensa*. There is only one submarginal line of spots on the hindwing above, the small subapical spots are nearly obsolete on the forewing above, and below, the red area in the upper median space is present or absent. The general colour is not so dark as in *intensa* and the species larger.

10. Danais (Salatura) litoralis, n. sp. Pl. II, fig. 4, *underside*.

Male, above black, a narrow pale ferruginous band in the cell, a much larger one occupying most of the interno-median space, and another in the lower median space, extending much further outwardly, slightly irrorated with white scales in the middle; a narrow oblique white subapical macular band from the costa, the spot above the upper median vein much beyond the line of those above it; one below it, large; three costal marks, a dot beyond the end of the cell, five marginal and three submarginal spots in the median spaces, one apical and one at the lower angle, all white. Hindwing black, a broad quadrate white band across the disc, and the end of the cell as far as the lower subcostal vein, scarcely reaching the submedian scent-gland, continued outwardly by obscure ferruginous rays, the veins there widely black, an outer row of submarginal white spots, with two inner ones subapically. *Below*, forewing with the ferruginous cell-striga obsolescent, two rows of minute submarginal spots subapically. Hindwing with two complete rows of submarginal white spots, and a few costal ones, including one basally along the lower side of the costal vein, the white area more broken, its discal spots outwardly incised, the cell-spot occupying two-fifths of the cell; most of the disc, including the base of the cell and the costal and subcostal spaces, ferruginous, edged with black; the veins all dark, the submedian and internal veins black bordered with white for most of their length; the outer black border glossed with chocolate-brown.

Nearest *Danais abigar* (*chionippe*) from the Philippines, figured by Mr. Distant from Province Wellesley, Malay Peninsula, though that locality seems to me rather dubious. It differs in the smaller ferruginous area on the forewing and smaller white area on the hindwing. From *D. fulgurata*, *affinis*, *aruana*, etc., it differs in the absence of white in the interno-median space of the forewing.

Sumba, scarce. An apparently identical form is common on the dry coast of Sambawa.

In the figure the forewing has been drawn much too short.

DANAIS (NASUMA) HARUHASA, n. sp.

Male, forewing extremely long and falcate, deep fuscous above; a long obscure reddish streak extends along the lower part of the cell, another more distinct, lighter in colour, and enlarged outwardly, in the interno-median space; a third, obscure, between the lower median veins; a small round discal whitish spot in each of the spaces below the upper radial vein, the second a little nearer the base than the others are; two small whitish spots, one on each side of the lower radial vein, are sometimes present (especially in the female) just beyond the cell. Hindwing with discal streak of pale brown, slender and rather obscure, a larger one in the cell: two rows of white submarginal spots, the outer subanal only, minute, the inner obsolescent near the median veins. *Below* dark brown, the apex of the forewing rufous, the pale reddish markings of the forewing somewhat larger, those of the hindwing larger and dull leaden-white in colour, reddish only at their truncate tips, the submarginal series complete and nearly equal. Forewing with the whitish discal spots larger, those just beyond the cell distinct. An additional white spot is present near the apex, and a row of outer-submarginal dots increasing towards the lower angle, an inner-submarginal series confined to the apex. In the female three or four of the outer-submarginal dots are sometimes visible above. In the male the sex-mark is somewhat less prominent than in *D. genutia*.

Sambawa, 1000—2500 feet, scarce. When on the wing it somewhat resembles an undescribed *Euplœa* found there.

Nearest *Danais ismare* from the Moluccas, but having the markings of the upperside reddish instead of white, and much reduced in size and number.

11. DANAIS (NASUMA) TAIMANU, n. sp.

Female. It obviously differs from the preceding species in the presence of a broad quadrate white discal band on the forewing, between the first subcostal and the upper median vein, in six pieces separated only by slender dark veins; below this there is one or sometimes two very small white spots. The submarginal spots are all obsolescent except one or two at the apex of the hindwing. The basal marks on the forewing are very indistinct, and merely paler not reddish, that in the cell absent. The discal marks on the hindwing are wholly undefined, resembling a large pale area, broken by dark veins. *Below*, there are generally one or two dots beyond the end of the cell, and also a few minute ones at the apex, one between the lower subcostal veins more distinct, more or less bifid. The hindwing has the leaden-whitish markings rather broader than in *D. haruhasa*, but those in the median spaces are much shorter, leaving the dark outer border very wide there. The submarginal dots are in one specimen wholly absent, in the other partly present, but very small.

The male is unknown. I took one female at Lateng (1000 feet) in Taimanu, Sumba, and another at Mandas, Sumba. I fear that both are now lost. When flying it somewhat resembles *Euplœa lewa*, and no doubt its mimicry of that species accounts for the presence of the broad white band, absent in *D. haruhasa* and *D. ismare*.

The subgenus *Nasuma*, as far as known, inhabits only the Moluccas, Sumba, and Sambawa, but no doubt a species will be found in Timor, while none is known from Java. It is distinguished by its elongate wings, and, at least in the two species described here, the flight is swifter than in *Danais genutia*, etc. It seems likely that these insects have lost some of the protective qualities of their allies, and have acquired a swifter flight and become mimics of other butterflies, the Moluccan form resembling a *Radena*, while the Sumba and Sambawa species look like *Euplœas* when flying.

12. DANAIS (TIRUMALA) LIMNIACE, Cram.

13. DANAIS (TIRUMALA) MELISSA, Cram.

Following Herr Semper's instructions, I easily separated these two species, which are extremely alike in general appearance. The *melissa*-form somewhat resembled the figure of *D. australis*, Hombron and Jacquinot. I also recorded a form of *D. gautama* in Sumba, but no specimens have turned up. *D. limniace* and *melissa* are both common in Sumba and Sambawa.

14. DANAIS (CHITTIRA) ORIENTIS, n. sp. Pl. II, fig. 5.

Near *D. nilgiriensis*. Cell-mark of forewing with all three rays distinct, though slender, in the females, the upper two obsolescent in the male, the interno-median marks broadly divided, the mark at the base of the lower median space wanting (present in *nilgiriensis*), that in the upper median space small and diffused (large and conspicuous in allied species), the streak above the radial vein much longer than the one above it (as in *D. larissa*), five or six submarginal dots. Hindwing with the cell-spot broad in the middle (narrow in *nilgiriensis*), divided longitudinally by a slender dark line (absent in *D. larissa* and *luzonensis*), a line of six outer-discal spots in the male, nine or ten in the female, the submarginal line of spots incomplete. *Below*, both lines of spots are complete.

Pada Dalung, Central Sumba: a very dull-coloured species. It appears to belong to Mr. Moore's newly-described genus *Badacara*, along with *B. nilgiriensis*.

A single male from Sambawa agrees in the main with those from Sumba. But the whitish markings are better defined and more transparent, the outer submarginal spots of the forewing extend on the underside to the apex, the elongate discal streak between the radial veins is shorter, and all the discal and submarginal marks of the hindwing are somewhat larger and more distinct. The specimen is not now in my possession, and I am unable to compare it with *D. larissa*.

15. RADENA OBERTHURII, n. sp. Pl. II. fig. 6.

Male, above dark brown, the markings yellowish, somewhat translucent; a pale streak along the costal vein, the tip clavate and more distinct; the basal cell-streak bifid, its upper ray very slender, short; terminal cell-spot narrow, obliquely transverse; interno-median space with two strong white bands scarcely convergent, a broad dark space between them; a large, elongate spot in the lower median space; a broad obliquely-transverse discal band of four large white spots separated by veins, one on the costa somewhat apart from the others, the fourth largest, ovate, the third incised outwardly; another small spot beyond these on the costa, and six small inner-submarginal spots, the upper three in a line across the apex, the others small, transverse, between the upper median and internal veins; no outer-submarginal spots are present. Hindwing paler brown than the forewing, the cell all white, a large spot in each space beyond it, making, besides the long submedian streaks, four in all, the second (above the upper median vein) incised outwardly, and projecting beyond the others, the first and fourth elongate, the third small, triangular; a line of about nine inner-submarginal dots, placed rather irregularly. *Below*, similar, five or six obscure outer-submarginal dots on the hindwing only. The tufts are long, as in *R. juventa*.

Nearest *Radena purpurata*, Butler, from New Guinea, from which it obviously differs in the two interno-median streaks, and the broad oblique discal band on the forewing.

I name this fine species in honour of the distinguished entomologist, M. Charles Oberthür, of Rennes. It is a dominant species in Sumba, occurring both on the coast and inland, and seems to be the most western representative of the Papuan group to which it belongs.

16. RADENA KAMBERA, n. sp. Pl. II. fig. 7.

Allied to *R. juventa*, from Java. The wings are shorter, and most of the white markings larger. The basal cell-streak is short and dusky, the outer one large, upright, the upper part projecting like the lower, a slender streak above it. The two series of subapical streaks of *juventa* are in *kambera* united into three very long white strigæ, that between the radial veins being nearly half an inch in length; all are incised outwardly; the inner-submarginal spots are large. Hindwing with the dark streak in the cell-spot continued to the end of the cell, slightly forked in the middle. *Below*, the light markings are not yellowish and greenish as in *R. juventa*, but pure white with a slight lilac gloss.

A very distinct species, not very common in Sumba.

In Sambawa there are two species of *Radena*, both I think distinct local forms. One, which appears to be the representative of *R. vulgaris*, is common everywhere; the other is very close to the Javanese *R. juventa*, and is confined to the higher country, though I have taken it as low as 1500 feet. I have now no specimens of either species, and am unable to compare them with their allies.

Family SATYRIDÆ.

17. LETHE EUROPA, Fab.

A female, Sumba, 2000 feet; another, Sambawa, 4000 feet, both resembling Java specimens.

18. MYCALESIS (ORSOTRIÆNA) MEDUS, Fab.

Sumba, Sambawa, common in meadows.

19. MYCALESIS (CALYSISME) PERSEUS, Fab.

The wet-season, ocellate brood prevailed in Sumba till the middle of March, when the non-ocellate form (*blasius*) took their place. In Sambawa, the latter brood had already begun to appear in the middle of April, but a long succession of heavy rains exterminated them, and the ocellate form reappeared and continued in exclusive possession till the latter part of May.

20. MYCALESIS (JATANA) WAYEWA, n. sp.

Female, above dark brown, a small ocellus on the forewing between the lower median branches. Hindwing outwardly whitish, gradually darkening inwardly, with two submarginal dark lines, a small ocellus between the lower median branches. *Below*, dark brown, slightly rufous, not perceptibly striate; a median transverse whitish line, angled at the upper median and above the submedian vein; beyond this the wing is much paler, with a rather small ocellus above the upper radial vein, a large one above and a small one below the lower median vein; a marginal line and two wavy, dark submarginal ones. Hindwing with the outer half whitish, the dark area very sharply outlined, projecting outwardly above the upper median vein; seven ocelli nearly in line, the first, fourth, and fifth large, subequal, the second and seventh minute; beyond this are two wavy submarginal and marginal dark lines.

The male is darker and more uniform, the ocelli less marked, with a golden-brown sex-mark (as in *M. mineus*) on the submedian vein of the forewing, and a large subcostal ochreous tuft, the subcostal vein and its upper branch, slightly swollen around its bifurcation. The prehensors and sex-marks agree with those of *Calysisme* and so does its venation, except in the point mentioned.

This species occurs both in Sumba and in Sambawa, confined in both to the higher and damper regions. It is apparently the local representative of *Mycalesis mynois*, Hewitson from Timor, but lacks the conspicuous white band of that species. I also suspect it to be the local representative of *M. mineus*, but without a more elaborate study of the prehensors I cannot well prove it. *Mycalesis mynois* is the type of Mr. Moore's genus *Jatana*, the *raison d'être* of which I have not been able to discover.

21. YPHTHIMA ASTEROPE, Klug.

Sumba only, found in the driest plains. It is worth remarking that this species has prehensors precisely like those of *Y. pandocus*, the size and habits of which are so different, while the markings are nearly identical.

22. YPHTHIMA LEUCE, n. sp.

A local form of *Y. philomela.* The forewing has a large, conspicuous, whitish sex-mark, and an ocellus as in *philomela;* the hindwing has the cilia white, and the outer and abdominal region grey, with two large blue-pupilled ocelli and two minute anal ones. *Below;* the striæ are very irregular; the forewing has a whitish discal band partly inclosing the large ocellus, and extending to the hind-margin; there is a submarginal dark band, the apex and costa are dark. Hindwing chiefly white, the disc being free from striæ over a considerable area, and elsewhere they are very delicate and irregular, forming an obscure transverse fascia, crossing the cell near its end, and a continuous, slender submarginal line. The six ocelli are in pairs, as in *Y. philomela* or *sepyra*, all black, pupilled with blue, and with large ochreous irides.

This species is found in Sumba and Sambawa. It may also be allied to *Y. aphnius* (Timor) of which only the dry-season form is known.

In that case it bears much the same relationship to *aphnius* as *Mycalesis wayewa* does to the Timorese *M. mynois*, the orange band of the hindwing of *T. aphnius* being absent.

Mr. de Nicéville has shown me that the true *Yphthima philomela* of Johanssen has no sex-mark. Since that is the case, the Indian form will stand, I suppose, as *Y. baldus*.

23. MELANITIS CONSTANTIA, Cram.

Sumba, Sambawa, not uncommon on the dry coast. A Sumba female before me has the ochreous band narrow and irregular, almost attaining the costa and the lower angle, its outer border undefined, with three obscure ocelli (the first chiefly white, the last nearly all dark), the outer border with three indentations, and projecting acutely inwardly along the lower median vein. Hindwing with two ocelli, the apical border narrowly ochreous. *Below*, the ocelli are rather small, the aspect that of *M. leda*, the wet-season form.

24. MELANITIS LEDA, Linnæus.

The dry-season brood (*ismene*) appeared in Sumba in the middle of March, in Sambawa in the middle of May; till that date the ocellate brood held the field.

Family ELYMNIADÆ.

ELYMNIAS UNDULARIS, Drury.

Sambawa, low country, not differing from Java specimens. No *Elymnias* is known from Sumba or Timor.

Family MORPHIDÆ.

A *Discophora* (*timora*, Wallace) has been found in Timor, but I saw none of the family either in Sumba or Sambawa.

Family BYBLIADÆ.

25. ERGOLIS ARIADNE, Linn.

Sumba, Sambawa, not differing from the Indian form, hardly so small and dark as the Javanese. I believe *E. merione* also occurs in Sambawa.

Family APATURIDÆ.

26. CYNTHIA DEIONE, Erich.

A single male, Sumba, interior. Common in Sambawa, where the females vary to a remarkable extent, some being as red as the male, while others are dark green insects like *parthenos*. Intermediate forms are common.

27. CETHOSIA PENTHESILEA, Cram.

Sumba and Sambawa, common, even on the coast. A single female taken in the interior of Sumba was very large and richly coloured, resembling the female of the Javanese *C. hypsea*, Doub., but I am not sure that it was distinct from *C. penthesilea*.

CETHOSIA TAMBORA, n. sp.

Black, the usual wavy submarginal lines absent on both wings. Forewing with an irregular ochreous subapical band of six marks, the first two slender, minute, the third elongate-quadrate, the fourth very small, triangular, the fifth long and narrow, the sixth large, triangular, paler; a dull reddish area on the hind margin and basally in the internomedian space, two or three reddish touches basally in the cell. Hindwing, basal half red, a small dark spot discally between the costal and the subcostal veins, and one between the subcostal branches. *Below*, all blue-black and ochreous-white, except a reddish area on the hind margin of the forewing.

The description, which is apparently that of a female, is a poor one, but I believe several specimens of both sexes are in Mr. Neumoegen's possession. It is very unlike any known species.

Sambawa, mountains, scarce. I have named it after the great Sambawan volcano, celebrated for its eruption in 1815.

I have dubiously recorded a similar species in Sumba, not taken, the underside more variegated.

Two very beautiful species, *C. lamarckii* and *leschenaultii*, were taken by Mr. Wallace in Timor, but neither seem to extend further westwards.

28. CUPHA ERYMANTHIS, Drury.

Sumba, Sambawa, normal. No *Cirrhochroa* was seen in either island, nor has any been recorded from Timor.

29. ATELLA PHALANTA, Drury.

Sumba, Sambawa. Sumba specimens are richly marked with purple below.

30. ATELLA SINHA, Kollar.

Sumba, Sambawa, normal.

31. CYRESTIS NAIS, Wallace.

Two tattered specimens from Pada Dalung in Sumba seem to be almost precisely intermediate between *C. nivea* and *C. thyodamas.* To indicate their affinities would require a long description. They seem near Mr. Wallace's *C. nais* from Timor, but without better specimens I cannot be sure of their position.

Symbrenthia hippoclus,[*]. Cram.
Sambawa, none taken.

32. Pyrameis cardui, Linn.
Dry meadows, Sumba.

33. Junonia atlites, Joh.
Sumba, Sambawa.

34. Junonia asterie, Linn. var., sumbæ.

Above, the subapical ocellus is indistinct, merged in the black band from the costa; the lower ocellus is large and set in a black patch. On the hindwing the lower ocellus is much larger than in Indian specimens of *asterie*, and is marked like the upper one. *Below*, the forewing has only two ocelli, the upper pair on the hindwing are more perfectly merged into one, the black transverse lines are replaced by diffused pale reddish ones; the hindwing has three pale bands across it.

Sumba, Sambawa, common. It is merely an extreme form of the Java variety (*J. javana*, Felder), which connects it with the typical Indian one, differing chiefly on the underside.

The non-ocellate form, *J. almana*, probably conspecific with *asterie*, was not taken.

35. Junonia vellida, Fab.

The upperside agrees with Godart's description. The underside is rather brilliantly marked with black or fuscous wavy lines on a pale grey ground, a reddish submarginal band, the hindwing with five ocelli, of which only the second and fifth are distinct, pupilled with bluish.

This pretty little species occurred only on the desert plains of Sumba, and seemed to be rare.

36. Junonia aonis, Linn.

The markings of the forewing are rather fuscescent than fulvous except the ocelli, of which only two are distinct, the lower small and attached to the upper. On the hindwing the second of the five ocelli is larger than the others. Otherwise the specimens agree with Godart's description. In the female there are distinct reddish-bordered ocelli on the forewing, and the sordid spots are larger. The underside is sometimes reddish, as is often the case with the female of *J. lemonias.* There seem to be two perfectly distinct seasonal forms, that of the dry-season resembling a dead leaf below.

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[*] In Eastern Java I found that the female of this butterfly was dimorphic, one form having the yellow spots replaced by white ones, so that it resembled a white *Neptis* instead of a yellow one. No intermediate forms were seen.

Sumba, Sambawa, those from the latter island not examined. The species is certainly very close to the Javanese *J. erigone.*

37. JUNONIA TIMORENSIS, Wallace.

In the male there is no distinctly rufous area except a submarginal band on both wings, evanescent apically on the forewing. In some females nearly the whole upper surface is more or less rufous, outwardly brighter, a dark area over the apex and disc of the forewing, the subapical spots united, a small distinct ocellus (obscure in the male) between the lower median branches. *Below,* the male is dark with the ocelli distinct, while the above-mentioned females are glossed with silvery-grey scales over both wings, obscuring the subapical band and the ocelli, the median transverse line distinct, angled at the upper median vein. These females evidently belong to the dry-season brood, just appearing at the time I left Sumba, and resembling the other form much as *J. almana* resembles *asterie.* I have not observed any male of this brood.

Sumba. This very distinct species, as Mr. Wallace justly calls it, was previously known only from Timor,

38. JUNONIA ORITHYIA, Linn.
Sumba, Sambawa.

39. PRECIS IDA, Cram.
Sumba, Sambawa.

40. PRECIS IPHITA, Cram.
Sumba, Sambawa.

41. YOMA SABINA, Cram.
Sumba, Sambawa, low country.

I see that Doubleday, followed by M. Oberthür and Dr. Semper, places this species in the very heterogeneous African genus *Salamis,* the type of which somewhat resembles a *Doleschallia.* The only species of *Salamis* at all like *Yoma* are *S. anacardii* and *anteva,* forming Wallengren's genus *Protogoniomorpha,* a name which ought to be barred on account of its enormous length. But in these species the cell of the hindwing terminates opposite the second forking of the median vein, in Yoma at some distance before it. The relations of homologous genera in different zoological regions are as yet very little known, and will no doubt greatly exercise the minds of naturalists in the next century. But for the present I think my genus *Yoma* may be allowed to stand.

42. HYPOLIMNAS MISIPPUS, Linn.

Sumba, Sambawa. The female mimics *Danais chrysippus* as usual.

43. HYPOLIMNAS BOLINA, Linn.

Sumba, Sambawa. The female sometimes has a red area near the hind margin of the forewing and over the disc of the hindwing.

44. HYPOLIMNAS SAUNDERSII, Wallace, (?).

Several broken specimens of what appeared to be a dwarf form of *H. pandarus* were taken in Sumba, but none have survived.

HYPOLIMNAS ANOMALA, Wallace.

One male, taken in the mountains of Sambawa. I am unable to say whether it was identical with Javanese specimens or not.

45. DOLESCHALLIA sp.

At least one species occurs in the dry coast region of Sumba, but no specimen was taken.

46. HELCYRA CHIONIPPE, Felder.

Several specimens seen at Pada Dalung in Sumba, but none taken.

47. CHARAXES ATHAMAS, Drury.

Sumba, Sambawa.

48. CHARAXES sp.

A very large *Charaxes* apparently of the *eudamippus* group was several times seen in the mountains of Sumba, and again in those of Sambawa. Unlike *C. eudamippus*, which is a ground butterfly, it always alighted high up on trees, so that I could never catch it. Another species, something like *C. pyrrhus*, was once seen in Sumba.

Family NYMPHALIDÆ.

49. PHÆDYMA COLUMELLA, Cr.

Sumba, Sambawa. The upper band of the hindwing above is much broader than in Indian specimens.

50. NEPTIS HORDONIA, Stoll.

Sumba, Sambawa. The yellow markings above are all much smaller than in Indian specimens.

51. NEPTIS NANDINA, var. SUMBA.

This form greatly resembles the Javanese *N. leucothoë*, a near ally of the Indian *N. varmona*, but the triangular white spot beyond the cell is narrow and elongate, sometimes extending on the underside two-thirds towards the margin. The subapical white band is somewhat less massive, and the four large discal spots are separated by veins, the first elongate, as large as any of the others. The upper band of the hind-wing is narrower, the submarginal lines remoter from the margin. The general colour of the underside is dark red, the white bands very slightly outlined with dark. Though the markings resemble those of *N. leucothoë*, the species is probably more allied to *N. nandina*. From this it may easily be distinguished by the brilliant white markings of the upperside. The discal spots are large, that between the upper two median veins large and elongate, the cell-streak is well separated from the triangular spot beyond the cell. The upper band of the hindwing is narrower, especially apically.

Sumba; a somewhat different form occurs in Sambawa, which I am now unable to examine. I did not observe any representative of the *varmona* group in Sumba.

52. ATHYMA PERIUS, Linn.

Sumba, Sambawa. As in India it generally occurs in open meadows, unlike all its allies.

53. ATHYMA KARITA, n. sp.

Male, above deep brown, variegated with darker areas, forewing with an outer-submarginal pale line, and an inner-submarginal series of slender obsolescent greenish streaks. An oblique subapical band of three greenish-yellow spots, the second largest, adjacent to the first, the third as large as the first, round, separate; cell unmarked; a broad discal macular band from the hind-margin to the second median vein, with a small triangular spot above it, that between the two lower median veins rounded-quadrate, as large as the one below it, separated from it only by a vein, and projecting beyond it. Hindwing with two greenish-yellow bands, the upper unbroken, very wide on the costa, extending to the submedian vein, where it tapers to a point; the lower band composed of six transverse spots cut by dark veins, their lower edges incised, the outer ones slender, lunular. *Below* the markings are similar, but whiter and more united, placed on a dull brown ground, a darker chocolate area discally on the forewing, a row of obscure darker submarginal spots on the forewing, and discally on the hindwing; the abdominal margin of the hindwing is broadly suffused with bluish.

Sumba, a single male taken by the river Waibaku near Pada Dalung, at 1,500 feet. The species seems intermediate between *A. venilia* and *A. amhara*.

ATHYMA NEFTE, Cram.

One male taken near Ndindi, Sambawa, at 3000 feet elevation. It is one of the apparently numerous Indo-Malayan species inhabiting the mountainous interior of this island.

54. LIMENITIS* PROCRIS, Cram.
Sumba, Sambawa.

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* I append the description of a very rare species from Perak, Malay Peninsula, allied to *L. daraxa*.

LIMENITIS AGNEYA, n. sp.

Male. Above very deep fuscous, a pea-green band across both wings. Base of forewing somewhat paler, with obliquely transverse darker markings in and below the cell: a submarginal pale line, an outer-discal row of six dark spots set in square paler spaces. The green band extends from the hind margin to the upper median vein in four spots separated by dark veins only, the upper spot a little out of line and smaller. Beyond these a line of three smaller spots runs to meet them obliquely, placed at right angles with the costa, extending from the upper median to the subcostal, the upper smaller than the others and whitish, placed above the inner half of the middle and largest one. More than halfway between these and the apex are two other spots also placed at right angles with the costa, and between the third and fifth subcostal veins, the lower small, greenish, the upper very small, whitish. On the *hindwing* the green band extends from the costa, where it is widest, to the submedian vein, tapering to a point. Its inner margin is convex, its outer straight; it is whitish at both ends and cut by slender black veins. The submarginal pale line and the outer-discal line of spots are much as on the forewing; cilia white, dark at the ends of the veins. *Below* light chestnut-brown, the band as above, but paler green and not cut by dark veins, the basal marks on both wings outlined with lilac, the outer-discal line of spots set in lilac areas, the submarginal line lilac, some darker red discal markings beyond the green band.

Obviously differs from *Limenitis daraxa* in the bifid green band of the forewing; agrees with it in the closed cells of both wings, which make the positions of the species in this genus rather dubious. My single male of *agneya* was taken on Larut Hill, Perak, at about two thousand feet elevation. *L. daraxa*, not apparently differing in any respect from the Himalayan form, was not uncommon at the summit of the same hill, nearly three thousand feet higher.

Prehensors, seen from the side. In *agneya* the uncus is long, sinuous, hooked at the tip, without branches, the clasp simple, straight, tapering gradually to the

LIMENITIS HOLLANDII, n. sp.

Male, above, black; cilia alternately black and white, a double undulating submarginal pale line, touched with whitish apically on the forewing; two united white spots placed obliquely subapically above the radial veins, with or without a smaller one below them. A broad common white band, very slenderly cut by dark veins, edged outwardly with purple, across both wings, extending on the forewing nearly to the upper median vein, the upper (fourth) piece small, the inner edge of the band straight, the outer irregular. Hindwing with the white band extending to the submedian vein, where it is tapering, both its edges nearly straight. *Below* chestnut-red of two different shades, the basal two-thirds of the cell mostly white, with a crooked dark mark, an irregular white spot at the end of the cell, its lower side tapering; the white band extends nearly to the lower radial vein; two submarginal pale lines, the inner mostly bluish-white with three white subapical spots; a chestnut longitudinal streak in the internomedian space. Hindwing with the two submarginal lines regular, grey, undulating, base chiefly white with transverse streaks of chestnut, namely, two in the cell, two between the costal and the first subcostal vein, one along the precostal vein; and a long one from the costa tapering to the submedian vein; the white band broad. It is rather a small species.

Several males taken in the Do Donggo country, Sambawa, all above 2000 feet. The species is nearest *L. lysanias* from the Celebes, but is without the rufous bands which that species has on the upperside.

I name the butterfly in honour of the Rev. W. J. Holland, of Pittsburgh, U. S. A., well-known as a lepidopterist.

55. SYMPHÆDRA ÆGLE, n. sp.

Male, above black, with some obscure ochreous-greenish spots near the costa, and three in the cell (two at the end), two in the internomedian space, one basal, the other further out, geminate; a row of five white subapical spots in a semicircle above the middle median vein, the second largest, then the first, the third diffused; also a macular submarginal band of dull bluish-whitish spots (the lower two sagittate) extending from the hind margin nearly to the apex, separated by dull

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tip. In *L. populi* the tip is abruptly bent downwards. In *daraxa* the tip is blunter than in *agneya*, and there is a long process arising from its upper edge, longitudinal and slightly ascending, set with denticles on both sides. The uncus is also shorter. The *lower uncus*, absent in most butterflies, is well developed in this genus, strongly hooked at the tip, its point opposed to that of the true or upper uncus, which can be brought into contact with it by muscular action.

bluish-green spaces. Hindwing with a broad bluish-green band from the abdominal margin (where it is whitish) to the costal vein (where it is blue), consisting of spots twice as long as wide, separated by black veins, their inner border diffused, the outer pointed, enclosing a large oval or cordate black spot, slenderly surrounded with blue. *Below*, forewing nearly black, slightly olivaceous apically, the markings white, more or less tinged with greenish or ochreous, arranged in two series, a submarginal one of five or six spots, and a discal one of seven, of which the third is evanescent, the fifth and sixth obliquely elongate, the seventh geminate and purplish; there are also spots on the inner disc, between the median veins and above each radial; cell crossed by two bluish-white bands, one in the middle, one at the end, with several additional spots at the base. Hindwing purplish-brown with a slight bronzy lustre; a submarginal band of dark spots in paler spaces; an irregular discal series of pale spots, three spots in the cell. Eyes dark, proboscis scarlet.

The colour of the underside, the narrow and dull blue band, and the numerous spots on the upperside distinguish it from *S. dirtea*.

A male, Pada Dalung, a female, Mandas, both in Sumba. I have no description of the female.

An *Euthalia*, dark like *E. garuda*, seems also to inhabit Sumba, but none were taken.

Family LIBYTHEIDÆ.

56. LIBYTHEA GEOFFROYI, Godart.

Two males, interior of Sumba. The blue of the forewing almost obliterates the subapical spots, which are barely traceable above; the luteous band of the hindwing is very obscure.

57. LIBYTHEA NARINA, Godart.

One female, interior of Sambawa, another seen in Sumba, not taken. The Sambawan specimen agreed well with Moluccan examples; The Philippine form has the white band of the hindwing reduced, while the Assam variety (*L. rohini*, Marshall), has it enlarged.

Family NEMEOBIADÆ.

ZEMEROS PHLEGYAS, Cram.

Sambawa, scarce. No species of this family was observed in Sumba.

Family LYCÆNIDÆ.

Subfamily *THECLINÆ.*

58. **Arhopala araxes**, Feld.

Sumba, coast. A local Celebesian form of *A. amantes*, but apparently distinct.

Flos apidanus, Hew., var.

Sambawa, 3000 feet.

Surendra quercetorum, Moore.

Sambawa, coast.

Subfamily *APHNÆINÆ.*

Iraota timoleon, Stoll.

Sambawa. I am almost inclined to think this species a mimic of the white species of *Neptis*; the resemblance is sometimes quite striking, and at any rate the *varmona* group of *Neptis* is partially protected.

59. **Curetis malayica**, Feld., var. **kiritana**.

Male black, the red area scarcely extending above the middle median vein, the hind margin dark. Hindwing with the end of the cell and the disc from the subcostal vein to about the lower median, red or reddish, the abdominal and costal margins very widely, the outer margin more narrowly black.

Sumba, Sambawa, scarce. This is, I think, the darkest *Curetis* known, Dr. Felder's *C. obscura*, described as a male, being really a female.

60. **Hypolycæna sipylus**, Feld.

Sumba, Sambawa. This is near Dr. Felder's *H. thecloides*, but the lower part of the hindwing above is bluish, not ochreous.

61. **Loxura atymnus**, Linn.

Sumba, Sambawa. Two or three more species of the *Aphnæinæ* were taken in Sumba, but the specimens are now lost.

Subfamily *DEUDORIGINÆ.*

62. **Rapala iarbas**, Fab.

Sumba, Sambawa, mountains.

Rapala orseis, Hew.

Sambawa, 1,500 ft., a male and a female.

63. RAPALA VARUNA, Horsf.

Sumba, Sambawa, mountains. I also observed a species of *Sinthusa** in Sambawa, but no specimens were taken.

Subfamily *LYCÆNINÆ.*

CYANIRIS AKASA, Horsf.

Sambawa, 4-5000 feet, rare.

64. CYANIRIS PUSPA, Horsf.

Sumba, Sambawa, mountains. The white area is larger than in Indian specimens, extending over three or four spaces and into the cell. The female has the white areas very large and not marked with blue.

65. ZIZERA PYGMÆA, Snellen.

Sumba, Sambawa.

66. ZIZERA LYSIZONE, Snellen.

Sumba, Sambawa. Another *Zizera* occurred in Sumba.

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* I append the description of a rare Javanese species of this genus.

SINTHUSA ASPRA, n. sp.

Male, above, forewing with the costa and the outer margin narrowly black, the base as far as the end of the cell, and more especially the basal half of the internomedian space to the hind margin, light violet-blue ; a diffused submarginal macular band of the same colour ; the disc and the outer half of the hind-margin black, deep blue in some lights, with a few scattered light-blue scales. Hindwing violet-blue, (much richer than on the forewing) from the lower subcostal to the submedian vein ; above the lower subcostal vein a line of pale blue scales ; the abdominal border widely silvery-whitish. *Below*, white, the spots chiefly very small, black, not annular as in all the allied species ; a broad dark fascia across the end of the cell of the forewing ; six discal spots, the upper three small, in an oblique line, the lower three larger, in a transverse line nearer the base ; a slender marginal dark line, cilia dark. Hindwing with the cell-fascia double ; eight discal spots, the fifth evanescent and nearer the base, the eighth elongate and conspicuous ; a large black spot in the lower median space ; in the next a blue area adjoining the black lobe ; beyond this a short black and blue marginal line ; tail chiefly black. The prehensors resemble those of *Deudorix*.

The hindwing is angled at the end of the middle median vein ; there is a short tail and a very small but distinct lobe. The venation and sex-marks are as in other species of *Sinthusa*. The species has no near allies.

Rare on Arjuno, Eastern Java, taken at 5000 feet in a flock of *Cyaniris akasa* from which it was indistinguishable when settled. The genus is usually mimetic. *S. nasaka*, Moore, strongly resembles *Hypolycæna erylus*, and I have several times mistaken *S. virgo*, Elwes, for a *Cyaniris*.

I have given Mr. de Nicéville the type of this species. The specific name means *white* in modern Greek.

67. Polyommatus bæticus, Linn.
Sumba, Sambawa, high country.

68. Chilades trochilus, Freyer *(putli)*.
Sumba, Sambawa.

69. Everes parrhasius, Fab.
Sumba, Sambawa.

70. Tarucus theophrastus, Fab.
Sumba.

71. Tarucus plinius, Fab.
Sumba, Sambawa.

72. Castalius ethion, Doub.
Sumba, Sambawa.

73. Castalius rosimon, Fab.
Sumba, Sambawa.

74. Castalius roxus, Godt.
Sumba, Sambawa.

75. Catochrysops cneius, Fab.
Sumba.

76. Catochrysops pandava, Fab.
Sumba.

77. Catochrysops strabo, Fab.
Sumba, Sambawa.

78. Nacaduba gaura, n. sp. Pl. II, fig. 8, *magnified two diameters.*

Male, above, pale violet, a narrow black border widening apically, the veins brown. Hindwing with a row of six black spots in whitish rings, a marginal dark line, cilia chiefly white. *Below* pale brown, heavily marked with white. Forewing with a serrate, catenulated line of dark spots, surmounted by a row of lunules outwardly whitish, inwardly dark; three transverse quadrate dark bands, paler in the middle, and bordered with white, namely, two in the cell, the basal one continued into the interno-median space, and a broader one across the wing discally to the submedian vein, slightly dislocated inwardly at the upper median vein, below which it is narrow and broken. Hindwing with a row of serrate ocelli as on the forewing, a very large black ocellus in the lower median space, slenderly edged with dark orange, and then a darker ring; a black anal spot; the three transverse bands much broken, the discal one forming two dark quadrate areas, the upper from the costa to the lower subcostal vein, the lower lying further out, extending thence to the upper median vein; the disc is chiefly white.

This curious species* is something like Dr. Felder's *Lycæna palmyra* from Amboina. The venation places it in *Nacaduba*, but it has little resemblance to the usual forms of the genus, and looks more like a *Catochrysops*.

Sumba, rare.

79. NACADUBA LAURA, n. sp, Pl. II, fig. 9, ♀, *magnified two diameters.*

Female, above, forewing about three-fifths dark brown; a large white area, sprinkled, especially at the base, with blue scales, extending from the cell to the hind-margin. Hindwing with the cell and the two spaces beyond it discally white, the rest of the disc paler brown; two submarginal rows of black spots, the outer round, the inner lunular. *Below*, forewing with a large white area occupying the end of the cell and the disc to the hind-margin; a basal transverse dark band across the cell and the interno-median space; the discal transverse bands are obliterated, except costally, one being represented by two brown lines extending from the hind margin into the white area as far as the middle median vein. Hindwing with the white area much smaller and duller-coloured, the transverse bands confused. Both wings have two submarginal rows of conspicuous dark spots, the inner large, black, semicircular on the forewing, lanceolate on the hindwing, the outer paler, transverse. The hindwing has two slender ocelli with slender irides of orange, touched with metallic, the outer one with the black area very large.

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* An allied species, of which *N. gaura* is presumably a local form, occurs in south-eastern Borneo and Java. I also took a male in Engano (unluckily omitted in my list), and I think I found it in the Nicobars. A Bornean specimen before me has the black marginal band above very narrow and equal, the black spots on the hindwing obsolete, except that in the lower median space, which is large. *Below* there are no distinct white areas, but all the markings are conspicuously edged with white. The discal band is bent outwardly and very irregular as far as the middle median vein, below which it it broad, straight and quadrate, the subanal ocellus is broadly bordered with orange.

I propose the name of *N. pseustis* for this species.

I took several females in Sumba, both on the coast and in the interior, and also a single male probably of this species. It was violet blue above, the margin very slenderly dark. Below the white areas were nearly obsolete on the forewing, and on the hindwing reduced a white bar in the band across the end of the cell, and a border one on the disc beyond the cell between the lower subcostal and upper median veins. Expanse over an inch and a quarter.

The species is near *N. perusia*, Felder, from Amboina, and *N. atrata*, Horsfield, from Java, but the extensive white areas of the female easily distinguish it.

80. NACADUBA HERMUS, Feld. (*viola*, Moore).
Sumba, Sambawa.

81. NACADUBA ARDATES, Moore.
Sumba, Sambawa.

82. NACADUBA MACROPHTHALMA, Feld.
Sumba. The female is marked almost as in that curious little species, *N. kerriana*, Distant, which I have taken at 4000 feet elevation in Karenni east of Burma.

83. NACADUBA DANA, de Nicéville.
Sumba, Sambawa. This is probably Mr. Druce's *N. almora*, but his figure and description are so bad that certainty is impossible.

84. LAMPIDES BOCHUS, Cram. (*Jamides bochus.*)
Sumba, Sambawa, rare. The only Sumba specimen I have examined has the blue area above very large, and not at all brilliant. It may be a distinct local form of this species, intermediate between *L. bochus*, Cram. and *L. astraptes*, Feld.

A *Lampides* which occurs in Borneo, Sumatra and the Malay Peninsula but has apparently escaped the notice of naturalists, has the underside like that of *L. bochus*, while the upperside has only a slender marginal dark line and is of a rich blue, darker than that of *L. elpis.* I have given Mr. de Nicéville a Bornean example for description.

85. LAMPIDES ANOPS, n. sp. Pl. II, fig. 10.
Male, above, rich azure-blue, violescent in some lights, darkening outwardly, translucent, a slender marginal dark line somewhat broader apically on the forewing, the cilia of the hindwing white. *Below*, groundcolour basally grey, darkening outwardly, but without the slightest

rufous tinge. The markings consist of slightly darker transverse bands, bordered by straight white lines, which are broad and very conspicuous. Forewing with one of these across the cell, with no markings above it costally, one discal from the costa to the middle median, then dislocated inwardly and continued obliquely to the lower median, below which the wing is white with a single dark streak in it. Hindwing with the bands confused and broken. Both wings have the cilia whitish, a marginal dark line, a catenulated line of dark streaks in a white ground, and behind this a line of very conspicuous black lunules, large and lanceolate on the hindwing; behind these are white lunules which extend far into the disc. There is no trace of ocelli, or of metallic scales.

The female is also blue, and has the outer two-thirds of the forewing black above.

Sumba, confined to the mountain-forests above 2000 feet. A beautiful and conspicuous species. I have not examined the prehensors, but the species is so unlike all others that its identification must be easy. In the figure the white markings of the underside have been made too narrow and inconspicuous.

86. LAMPIDES MASU, n. sp. Pl. II, fig. 11.

Male, above, bluish-white, whiter than *L. ælianus*, a very slender marginal black line nearly obsolete apically; hindwing with this line more distinct; a broken, catenulated, submarginal dark fascia, double at the anal angle, obsolete apically, with a good-sized dark spot in the lower-median space. *Below* pale brown, the bands scarcely perceptibly darker, bordered by white lines, of which the basal pair on the hindwing are slender; on the forewing one band crosses the cell, one is beyond it from the costa to the middle median vein; these two are continued in common by another nearly to the hind-margin. On the hindwing the bands are irregular, extending further outwardly than in *L. anops* (in which the submarginal lunules greatly encroach on the disc), acutely angled in the interno-median space. Both wings have three conspicuous white submarginal lines enclosing two lines of spots, the outer linear, catenulated, slender, the inner large, black and conspicuous, tranverse and wholly surrounded with white on the forewing, lanceolate and irregular on the hindwing. Hindwing with a large subanal ocellus with a narrow orange iris, surmounted by a black and a white lunule; a small similar anal ocellus; both are touched with metallic.

This species is very like the Amboina female figured by Cramer as *aratus*, and is probably a local variety of that species. The female of *L. masu* has the black border of the forewing broad and serrate apically, the inner cordate spots of the hindwing are large and black. The male differs from *L. subditus*, Moore, in the whitish upperside, and in the pale underside, heavily marked with white, with the orange area smaller; it resembles it in the submarginal band of black spots. *L. subditus* is very close to *L. amphissa*, Felder, from Amboina.

87. LAMPIDES CELÆNO, Cr.
Sumba, Sambawa.

88. LAMPIDES ELPIS, Godt.
Sumba, Sambawa.

89. SPALGIS EPIUS, West.
Sumba, Sambawa, found on the acacias growing along the dry shore, the specimens normal.

90. MEGISBA MALAYA, Horsf.
Sumba, Sambawa.

91. NEOPITHECOPS ZALMORA, Butler.
Sumba, Sambawa.

Subfamily *GERYDINÆ*.

92. GERYDUS TEOS, n. sp.

A local form of *G. symethus*. The white area above is large, extending furthest below the middle median vein; there are no bluish scales; the upper median vein is swollen at its base. Hindwing all dark, not bluish-grey as in *symethus*. *Below* nearly uniform pale brown, a dark area crossing the end of the cell, surrounding the median vein and its branches discally; beyond this there is a whitish area from the middle median vein to the hind-margin; the transverse discal lunular band only extends down to the middle median vein. Hindwing with the discal lunules nearly joined, very distinctly marked, scarcely darker than the ground-colour, edged with paler. Both wings have a submarginal dark line edged inwardly with whitish, and containing a black dot in each space. The underside is wholly without the sordid irrorations found in *G. symethus*.

The female has a little less white on the forewing above, and a little more white below. The hindwing is acutely angled in the middle and is unmarked above.

Sumba, Sambawa. The Javan form (*G. pandu*, Horsf.) may also be distinct from *G. symethus*.

93. GERYDUS BOISDUVALII, Moore, var. ACRAGAS, nov.

Male, above, forewing with the base of the upper median vein swollen beyond the cell and placed in a small longitudinal pale space, no other markings above. Female with a narrow straight white band beyond the cell, extending obliquely to the lower median vein, broken by the dark middle median vein. *Below*, forewing with a white area over the disc to the hind margin, the transverse discal band formed of joined incomplete lunules in both sexes. The female has the hindwing slightly angled.

Sumba, Sambawa. I cannot compare this with the Javanese form, the male of which is still undescribed. But the shape of the band in the female of *G. acragas*, which resembles that of the male of *G. biggsii*, the absence of white or pale markings above in the male, and of sordid irrorations on the underside in both sexes, easily distinguish it from the Indian form of *G. boisduvalii*. It is obviously distinct from a form mentioned by Mr. Distant, who says "in an Amboinese species *G. boisduvalii*, Butler, the distinctive colouring of the anterior wing is reversed, the male having the largest white area to the anterior wings."

The male of *acragas* must certainly be very much like that of *G. irroratus*. Dr. Semper doubtfully identifies with that species a Philippine form having a large round median white patch in the female. I think this very unlikely to prove correct. *G. irroratus* is certainly very close to *G. boisduvalii*, but till the female of Mr. Druce's Siamese form is discovered, the question must be left open.

Family PIERIDÆ.

94. NYCHITONA XIPHIA, Fab.

Sumba, Sambawa, varying greatly in size and markings.

No *Elodina* was seen in either island, though *E. egnatia* is known from Timor.

95. TERIAS HECABE, Linn.

Sumba, Sambawa, several varieties.

96. TERIAS SARI, Horsf.

Sumba, Sambawa.

TERIAS DRONA, Horsf.

Sambawa, 2-4000 feet. *T. candida*, found by Mr Wallace in Timor, was not seen.

97. TERIAS HARINA, Horsf.

Sumba, Sambawa.

HUPHINA TEMENA, Hew.
Sambawa. A very beautiful species.

98. HUPHINA JULIA, n. sp. Pl. II, fig. 12.

Male, above, creamy-white, a black marginal fascia, scarcely wider on the forewing than on the hindwing, its inner border diffused; the submarginal dark bands of the underside visible through the wings; all the veins of the forewing dark, as well as those of the hindwing outwardly. *Below*, forewing white, a submarginal diffused brown band, connected along the two upper median veins with a dark longitudinal band in the lower part of the cell; apex diffused ochreous-yellow, the yellow area just crossing the submarginal band costally, the outer margin narrowly brown. Hindwing bright yellow; a narrow dark marginal band, a broad, irregular, serrate dark submarginal band enclosing seven large orange-scarlet spots, obsoletely edged with yellow; the subcostal space nearly all scarlet, without any black border inwardly or outwardly. Expanse two and two-third inches.

Female, above, forewing with all the veins heavily outlined with dark, the spaces more or less white, a united subapical white band, and a row of submarginal spots. Hindwing pale yellow, the veins slightly darkened, a broad outer dark band enclosing white spots. *Below*, duller than the male, the radial and upper median veins of the hindwing marked with lines of blackish scales.

Nearest *H. læta*, Hewitson, from Timor, which has the forewing broadly and the hindwing slenderly black above, while below, the disc of the hindwing is uniform black, the submarginal dark band of the hindwing is obsolescent, and the scarlet costal stripe bordered on both sides with black. It is a much smaller butterfly than *H. julia*.

Sumba, interior.

This insect, the most beautiful Oriental species of *Pieris* known, has when flying none of the air of a protected butterfly. If it stood alone, I should certainly suppose it to be a mimic of some form of *Delias hyparete* yet undiscovered in the island. But both *H. læta* and *H. temena* require to be accounted for in the same way, and while it is possible that some Timorese *Delias* may resemble *H. læta*, I feel sure that *H. temena* can have no such original. It must then be assumed that this group is less pressed by its enemies in the Timorian Islands, and has therefore been able to acquire more brilliant colours than its allies.

Huphina læta, julia, temena and *tamar* form the nearest approach to a peculiar group of butterflies which these islands possess. But *H. tamar* is from Bali, beyond Wallace's Line, and no doubt extends into Eastern Java.

HUPHINA NAOMI, Wallace.
Sambawa.

99. HUPHINA EIRENE, n. sp.

Male. It differs from *H. naomi* in the colour of the hindwing below, and that of the subapical spots of the forewing, being lemon, instead of rich orange-ochreous. Above, the median vein and its upper branch are more widely marked with black, and the white of the cell and the hind margin of the forewing is clearer and purer.

In these points it agrees with *H. judith*, Fab. (Java), but differs in the narrow dark markings of the forewing above, the long white discal markings being slenderly continued nearly to the margin. *Below*, the forewing has three subapical lemon spots, a large white spot between the upper median branches, and two white spots beyond the cell, the one above these being obsolete. The black border of the hindwing is narrower than in *H. judith*, enclosing a lemon spot between the subcostals, one (obsolescent) above the radial veins, and one, large and diffused, between the upper median branches; an ochreous spot partly enclosed between the lower median and submedian veins; the anal angle slenderly edged with orange-ochreous.

Sumba, interior, rare. I cannot find the type, and the description is not very good. The species, however, which I compared with good series of *H. judith* and *naomi*, is distinct. It is curious that it should more approach the Javanese species than that of the neighbouring islands.

The species figured by Hombron and Jacquinot in the "Voyage au Pole Sud," as "*Pieris judith*, var," and so placed by Kirby, is certainly distinct. I suggest for it the name of *Huphina imogene*. It is nearest my *H. ethel* from Engano.

HUPHINA VASO, n. sp.

A local form of the Javanese *H. corva*. Male, above, darker than in that species, all the veins heavily outlined with black. Forewing with an almost complete, irregular, outer-discal dark band extending obliquely from the costa to the hind-margin, and continued along the latter to its base; the white submarginal spots beyond this are large. Hindwing with the cell, the upper median, and both the subcostal veins clouded with black, the black border deeply dentate, with a line of diffused black spots submarginally in the middle of the spaces. *Below*, paler than in *corva*, the white markings, especially the submarginal ones, all larger and clearer, the veins all slenderly outlined with ochreous.

Sambawa, coast.

BELENOIS JAVA, Sparr. (*coronea*, Cr.).

Coast of Sambawa, common, not seen in Sumba. Cramer records this species from Borneo, and in the Singapore Museum there is a specimen labelled Jelebu (not far from Malacca). These localities are certainly doubtful, as the butterfly inhabits dry, sterile coasts, and would be quite out of place in forest countries like Malacca or Borneo. On the other hand a coast-butterfly of exceedingly weak flight, but able to float in the air for an indefinite time, would be more apt to be blown out to sea than other insects, and more likely to survive till its arrival in another island. So that stragglers may really have been taken remote from the true habitat of the species.

This butterfly flies like a *Hestia*, and seems to be the most perfectly protected of Eastern *Pieridæ*. It is hard to believe that it has anything to do with the Indian *Belenois mesentina*, the type of the genus, which is wholly different in appearance and in habits. Like *Delias* and *Prioneris* this genus has the claws bifid.

DELIAS PASITHOË, Linn., var.

I saw two specimens of this on Mt. Harahasa in Sambawa at nearly 5000 feet elevation, but as well as I can remember neither were taken. An undescribed *Agarista* mimicking it was caught at the same place. No species of *Delias* was observed in Sumba.

DELIAS ORAIA, n. sp.

A local form of the Indian *Delias descombesii*, and greatly resembling it. It lacks, however, the black marginal band of *descombesii*, the costa and outer margin of both wings being slenderly grey, especially at the ends of the veins, the cilia lemon. *Below* the five subapical lunules on the forewing are yellow, not white. The female is generally brighter coloured than that of *descombesii*. The hindwing, however, is much darker over the base and disc, but below the submarginal spots are bright lemon, and the hind-margin rich ochreous.

Sambawa, 2—5000 feet, scarce. The specific name means *beautiful* in modern Greek. I thought it unnecessary to give my detailed description of the species.

The reappearance in Sambawa of a local form of an Indo-Malayan butterfly unknown to Java, is remarkable.*

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* I take the opportunity to describe a new Javanese species of this genus.

DELIAS AURANTIA, n. sp.

Near *D. belisama*, Cr. Above orange over the basal half of the wings, including all the cell, the disc as far as the upper radial vein, far beyond the cell, and the hind

100. APPIAS* PAULINA, Cr.

Two forms of this very puzzling group occurred both in Sumba and in Sambawa. One was all white, with only a slender dark marginal line, resembling *A. albina*. The other had the hindwing and the apex of the forewing bright ochreous-yellow below, resembling *A. lankapura*, but without the dark apex. It generally had a black or gray discal spot on the forewing.

I have dubiously recorded *Appias lyncida* from Sambawa, and from Sumba a female which I supposed to be that of *A. (Saletara) nathalia*.

101. NEPHERONIA VALERIA, Cr.

Sumba, Sambawa. The submarginal spots are wholly absent. No yellow female was taken. A different species is, I think, also found in Sumba.

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margin to the lower angle; the rest black, its inner border serrate. Hindwing with the black border rather wide and equal. *Below*, forewing black with four (five in *belisama*) orange subapical streaks, the lowest obsolescent; a broad oblique orange streak borders the disco-cellular veins, the cell and median veins are outlined with pale orange, the rest of the cell irrorated with black scales, the hind-margin broadly whitish. Hindwing orange like the upperside, the red area darker than in *belisama* and much larger; the inner lunular band more continuous, a marginal yellow line (nearly obsolete in *belisama*), the inner half of the wing, including most of the cell, and on the disc from the hind-margin to beyond the middle median vein, densely irrorated with black scales. Expanse 3¼ inches. From *D. belisama* this may be distinguished by the much smaller black area of the upperside of the forewing, and the large orange areas of the underside of the same wing. The male of *D. belisama* is also usually white, or white tinged with lemon, or yellow with a slight ochreous tinge. From *D. nakula*, recently described from Java by Mr. H. Grose Smith, *D. aurantia* differs in its larger size and rich orange colour.

This fine butterfly is not uncommon on Mount Arjuno, Eastern Java; I did not take it below 2,500 feet elevation, and it is found at any rate up to 5000 feet. *D. belisama* is also common there, ranging from the low country up to about 3000 feet, so that there is a zone where both are found. When flying together *D. belisama* could always be distinguished by its smaller size, East Java specimens being apparently smaller than West Java ones, and under three inches in expanse. On visiting the great volcano of Sméru further east at a different season, I found *belisama* common, but did not see *aurantia* at all.

At 5000 feet on Arjuno, I took a single faded specimen of a *Delias* only 1¾ inch in expanse. It was white, the outer half dark, the forewing with a subapical bar and a row of five subapical spots. The hindwing had the margin broadly black with five yellow (?) spots in it below only. This species does not resemble anything known to me.

* This is one of Hübner's silly genera, grounded on nothing whatever. I use it most unwillingly as the equivalent of Mr. Wallace's *Tachyris*. Mr. Distant includes the species of *Huphina* (Mr. Wallace's *Pieris*) under *Appias*, for which I can see no reason. *Catophaga* necessarily falls before *Appias*.

102. Hebomoia glaucippe, Linn.
Sumba, Sambawa.

Ixias reinwardtii, Voll.
Sambawa, a beautiful species, confined to the dry coast.

103. Ixias near pirene, Linn. (*pyrene*).
Sumba, coast, several times seen, but no specimen taken.

Catopsilia pyranthe, Linn. (*evangelina*, Butler).
Sambawa, coast, not observed in Sumba.

104. Catopsilia catilla, Cr.
Sumba, Sambawa.

105. Catopsilia crocale, Cr.
Sumba, Sambawa.

106. Catopsilia scylla, Boisd.
Sumba, Sambawa.

Family PAPILIONIDÆ.

107. Papilio (Orpheides) erichthonius, Cram. (*erithonius*).
Sumba, Sambawa.

108. Papilio (Iliades) merapu, n. sp.

Male, above like *P. memnon*, the pale rays gray, and not very distinct on the forewing. *Below* the basal crimson areas are larger, the longitudinal streaks in the cell of the forewing obsolescent. Hindwing with the outer pale area partly gray, partly orange-ochreous, narrow, the outer line of spots many times larger than in *memnon*, the inner lying outside of the band, only touched outwardly with ochreous; a separate oblique orange stripe on the abdominal border. The species is the largest of the group, much larger than *memnon*, its expanse being six and a half inches.

Koloki, Pada Dalung, Sumba, 2—3000 feet.

This fine butterfly is called by the Sumbanese after their god Merapu, and I was told that it was after a fashion held sacred, though they raised no objection to my catching specimens. As an instance of the sober tastes of this people, I may remark that they consider this butterfly far handsomer than *Ornithoptera naias* or *Papilio maremba*.

A form of *Papilio memnon* occurs in Sambawa, but I have no specimens.

109. PAPILIO (MENELAIDES) OREON, n. sp.

A local form of *P. liris*, Godart, from Timor and Australia, differing from de Haan's figure of that species in the following particulars. Female, forewing with the dark border narrower than in *liris*, the pale area not tinged with yellow, extending nearly to the base and apparently more marked with black scales. On the hindwing below, the whitish area is less yellow, extends nearer to the base, (occupying two-thirds of the cell), and somewhat further discally, its outer margin scalloped. The white area between the costal and subcostal veins is nearer the base of that space, and is much narrower, being not so long as broad, deeply concave outwardly. There is a submarginal row of seven crimson spots (five in *liris*), that in the interno-median space joining the white area so as to enclose an oval black spot. On the upperside, the hindwing is obscurely marked with red as in *liris*. Expanse four inches and three quarters.

Of the male I have only one very bad specimen, not perceptibly different from the female.

Sumba, confined to the mountain-forests from which I have named it.

PAPILIO ARISTOLOCHIÆ, Linn.

Sambawa, normal.

110. PAPILIO (CHARUS) HELENUS, Linn.

Sumba, Sambawa, confined to the mountains, scarce.

111. PAPILIO (HARIMALA) MAREMBA, n. sp.

Male, above black, the markings metallic golden-green, greenish-blue in some lights. Forewing with the base, all the cell and two-thirds of the hind-margin uniformly powdered with green scales; just beyond the cell and forming a crescent round it, is a rather narrow band of rich green from the upper median vein to well above the subcostal, the veins black; beyond this a broad black band, but slightly irrorated with green; after which there is a broad subapical and submarginal area of diffused green, with separate green spots between the median veins; the outer and costâl margins dark; the hind-margin rich green near the lower angle as far as the middle of the interno-median space. A large unbroken dark discal patch covered with a cottony mass of odoriferous hairs, extending from the internal to the upper median vein, reaching inwardly almost to the cell, and outwardly along the veins almost to the outer margin. Hindwing with the base powdered with green, a broad green discal area, scarcely entering the cell, extending from the upper subcostal vein to the hind margin, broadest discally;

beyond it are four green lunules; the outer part, including the tails, black. *Below*, the basal half of the wings deep brown, sparsely sprinkled with whitish scales; forewing with a pale transverse band (much more remote from the base than in *P. pericles*), broad subapically, deeply indented outwardly, below the two lower subcostal branches, abruptly narrowed below the lower radial vein. Hindwing with the disc somewhat whitish subabdominally, a row of seven narrow ocelli, outwardly silvery blue, inwardly dull reddish. The ocelli are much further from the outer margin than in the allied species.

This splendid species has no near allies. Apart from the sex-mark, it is nearest *Papilio brama*, Guérin, from Borneo, Sumatra, and the Malay Peninsula.

Sumba, rare near the coast, commoner in the remote interior.

PAPILIO (HARIMALA) PERANTHUS, var.

Sambawa, mountains, scarce. It seems to be intermediate between the Javanese *P. peranthus* and the Timorese *P. pericles*. I have unluckily neither specimens nor description.

112. PAPILIO (ZETIDES) SARPEDON, Linn.

Sumba, Sambawa. In Sumba the red markings of the underside are sometimes replaced by ochreous-yellow.

113. PAPILIO (ZETIDES) EURYPYLUS, Linn.

Interior of Sumba and Sambawa, scarce.

114. PAPILIO (ZETIDES) AGAMEMNON, Linn.

Sumba, Sambawa.

PAPILIO (PATHYSA) ANTIPHATES, Linn.

Sambawa.

115. PAPILIO (LAERTIAS) POLITES, Linn.

Sumba, Sambawa. In Sambawa one female imitates *P. aristolochiæ*, while another is similar, but with the white discal area replaced by orange. I have unluckily not recorded any female from Sumba.

116. ORNITHOPTERA NAIAS, n. sp.

Male, above black, all the veins except at the extreme base and the internal vein, bordered with paler brown, a longitudinal pale streak generally in the middle of the cell. Hindwing with a small translucent golden patch occupying less than half of the cell longitudinally (its lower and basal part black); four discal spaces from the costal to the upper median vein occupied by quadrate golden areas, which are not incised outwardly as in *O. plato*; that between the costal and subcostal veins is largest and broadest; a slight diffused golden touch between the upper and middle median veins, more distinct below. *Below* forewing with the pale streaks whitish. Collar and patches at the base of the wings red, abdomen mostly black except around the base of the valves.

Female, above dark brown, the pale streaks conspicuous, whitish, occupying two-thirds of the cell, where they are broad with a conspicuous streak in the middle. Hindwing with a golden area, slightly duller than that of the male, occupying two-thirds of the cell transversely, and six discal spaces from the subcostal to the fold above the submedian vein; a minute spot above the subcostal, the next area small, all of them deeply incised outwardly; four pairs of triangular yellow spots are usually on the outer disc, sometimes connected with the inner golden area, by rays of the same colour; there are a few marginal internervular ochreous touches. Collar and base of wings red, abdomen laterally and ventrally yellow with black spots.

The outer margin of the hindwing of the male is remarkably straight; its expanse is nearly five and a half inches.

The golden area of the male differs considerably from that of *O. criton* (Moluccas) and *O. plato* (Timor). In *plato* the red patches are wanting; the female is unknown. In *criton* the female is altogether different. The golden area is probably smaller in *naias* than in any other species of *Ornithoptera*, except the Celebesian *O. haliphron*, in which the cell is all black.

Common in Sumba, both on the coast and in the interior.

In Sambawa occurs a variety (*O. naias*, var. *sambavana*), which is considerably larger. The female has a large golden spot between the costal and subcostal veins of the hindwing; the outer discal pairs of spots are always connected with the central golden area, more or less enclosing large black spots. In the male a golden spot (generally present, though small in the Sumba form) between the upper and middle median veins, is always absent, while in *O. criton*, and presumably in *O. plato*, it is the largest of all.

Family HESPERIADÆ.

Ismene Group.

117. Parata malayana, Feld.

Sumba. Another species occurred both in Sumba and Sambawa.

118. Hasora badra, Moore.

Sumba, Sambawa. Both this and the Engano form resemble the Javanese, which may and may not be the same as the typical Indian one.

119. BADAMIA EXCLAMATIONIS, Fab.
Sumba, Sambawa.

Tagiadas Group.

120. TAGIADES BRASIDAS, n. sp.

Male, above dark brown, forewing with three subapical hyaline spots, the first two approximate, the third well beyond the others, small; two small discal spots, and two terminally in the cell, hyaline. Hindwing, dark brown, the disc irrorated with gray scales, and bearing three dark spots; the abdominal angle widely white enclosing a line of marginal dark spots, the cilia long, white. *Below*, forewing touched with whitish below the lower median vein. Hindwing two-thirds white, with three subapical dark discal spots (the first united with the apical dark area), the second and third unequal, united, the apical border widely dark brown, tapering to below the lower median vein, twice interrupted by white. Female, like the male the hyaline spots in the cell of the forewing united, the discal ones larger, the brown spots bordering the hindwing smaller above and below.

Sumba, and Sambawa, but those from the latter island may not be quite the same. The species is nearest *T. helferii* from the Nicobars, differing in the white border on the hindwing above, and the dark spots on it below. The hyaline marks are also more conspicuous. This also distinguishes is from *T. alica*, which is also much less white below, and has no distinct marginal spots.

121. ABARATHA SYRICHTHUS, Feld.

Above, the discal yellowish bands of the hindwing are much narrower and more obscure than in Indian specimens. Below, the forewing is altogether less white; the white mark beyond the cell, which in the Himalayan form extends far outwardly, is reduced to a slender, transverse crescent; the costal streaks above it are obsolete, the submarginal line of quadrate spots much smaller, and the fifth hyaline spot absent.

Sumba, rare.

ABARATHA HYPERIDES, n. sp.

Very near *Pterygospidea helias*, Felder, from the Celebes, but the bands and the discal hyaline spots of the forewing are absent, and the apex of the hindwing is broadly dark. From *A. sura* it differs in the forewing, which is almost uniform dark brown above and below. The hindwing is also less variegated above and below, the white area is larger and more uniform, the inner line of spots is obsolete, the outer united, and dark apically, nearly obliterated by white scales in the median spaces.

Sambawa. Another species, more like *A. angulatus*, was found in Sumba, but no specimens have survived.

Gehlota Group.

122. Coladenia dan, Fab.

Sumba, Sambawa. Two species are confused under this name, and occur together in Sumba, Borneo, the Malay Peninsula, and perhaps elsewhere. They differ obviously in flight and in prehensors, but I cannot at present point out any difference in the markings. One has an egg with numerous ribs (over forty) as in *Gehlota*, the other with few (seventeen) as in *Tagiades*.

Pamphila Group.

123. Tilicota mæsoides, Moore.

Sumba, Sambawa. The orange bands are smaller and narrower than in Indian specimens, and the ground-colour dark below.

124. Telicota nigrolimbata, Snellen.

Sumba, Sambawa. This is the species figured by Mr. Distant; I am not quite sure of its identity with Heer Snellen's species.

125. Telicota gola, Moore.

Sumba, Sambawa.

126. Ampittia maro, Fab.

Sumba, Sambawa. I am doubtful of its identity with the Indian form.

Baoris Group.

127. Chapra mathias, Fab.

Sumba, Sambawa.

128. Parnara narooa, Moore.

Sumba, Sambawa. I am not sure of its identity with the Ceylon form.

Suastus Group.

129. Suastus chilon, n. sp.

Above, male all dark brown, no hyaline markings nor patches of lighter-brown scales. *Below*, forewing with a minute white dot discally in the lower median space, the subapical hyaline spots represented by two slight dark streaks, the lower (in one specimen) containing a lighter dot. Hindwing nearly white (not gray as in *S. gremius*), the borders dark, a conspicuous black cell-spot, and a row of black discal spots. six in one specimen, four in the other.

The absence of hyaline spots distinguishes it from all others.

Two males, Sumba coast.

Kerana Group.

130. PLESIONEURA RESTRICTA, Moore.

Sumba, Sambawa, mountains. My Sumbanese *Hesperiadæ* hav suffered more than any other family, and I have been compelled to omit a number of species, a *Halpe*, two *Parnaras*, a *Parata*, etc.

EXPLANATION OF PLATE II.

Fig. 1. *Euplœa eluesii*, n. sp. ♀.
2. *Euplœa lewa*, n. sp.
3. *Euplœa palmedo*, n. sp.
4. *Danais litoralis*, n. sp.
5. *Danais orientis*, n. sp.
6. *Radena oberthurii*, n. sp.
7. *Radena kambera*, n. sp.
8. *Nacaduba gaura*, n. sp., × 2.
9. *Nacaduba laura*, n. sp. ♀, × 2.
10. *Lampides anops*, n. sp.
11. *Lampides masu*, n. sp.
12. *Huphina julia*, n. sp.

VI.—*Natural History Notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander* R. F. HOSKYN, R. N., *commanding.* No. 24. *List of Deep-sea* Holothurians *collected during seasons* 1887 *to* 1891, *with descriptions of new species.—By* DR. J. H. TULL WALSH. *Communicated by the* SUPERINTENDENT OF THE INDIAN MUSEUM.

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Order ELASIPODA, Théel, Chall. Rep. vol. iv, Hol., p. 9.

Family **Elpididæ**, Théel, l. c., p. 10.

1. PENIAGONE WYVILLII, Théel, Chall. Rep. vol. iv, Hol., p. 42.

One specimen.

Station 118, 15th December, 1890, Bay of Bengal, lat. 12° 20′ N., long. 85° 8′ E., 1803 fathoms, globigerina ooze, bot. temp. 35° Fahr. (*Alcock*).

Family **Deimatidæ**.

2. ONEIROPHANTA MUTABILIS, Théel, l. c., p. 62.

One specimen.

April 12th to 13th, 1888, Andaman Sea, N. Sentinel Island bearing N. 15°, W. 18 miles, 250 fathoms (*Wood-Mason*).

3. Deima validum, Théel, l. c., p. 68.

" Transparent light orange-red " (*Alcock*).

Two specimens.

April 16th, 1888; Bay of Bengal lat. 11° 15′ N., long. 91° 16′ E., 1840 fathoms, globigerina ooze (*Wood-Mason*).

A fine specimen; length 130 mm.; length of lateral processes 55 mm.

Station 117, Bay of Bengal, lat. 11° 58′ N., long. 88° 52′ 17″ E., 1748 fathoms, globigerina ooze with pieces of pumice, bot. temp. 35·3° (*Alcock*).

4. Deima fastosum, Théel, l. c., p. 71.

Two specimens.

Station 118 (*Alcock*).

April 20th, 1888, Bay of Bengal, lat. 6° 18′ N., long. 90° 40′ E., 1520 fathoms (*Wood-Mason*).

5. Orphnurgus asper, Théel, l. c., p. 82, var. glaber, nov.

Length 150 mm. Body smooth and leathery; skin thin and somewhat transparent; colour (in spirit), body greyish white, feet and processes yellowish-white. Tentacles 20, long, extremities brownish and dendritic. Ventral feet 24 on each side, longer and larger near the centre of the body than at the extremities; longest 20-25 mm. Lateral processes generally longer than the pedicles, longest 30 mm. Two rows of processes on each dorsal ambulacrum; these vary considerably in size and short and long ones seem to alternate. Mouth slightly ventral; anus terminal and patulous. Calcareous bodies, spinous rods or smooth rods with branched extremities. Polian vesicle single, 40 mm., wider in the middle than at the extremities.

Colour in the fresh state " salmon-pink " (*Alcock*).

One specimen.

Station 112, 7th November, 1890, Bay of Bengal, lat. 13° 47′ 30″ N., long. 92° 36′ E., 561 fathoms, grey mud, bot. temp. 44·9° (*Alcock*).

6. Pannychia wood-masoni, n. sp.

Length 300 mm. Body long, flat and of equal width throughout; skin calcareous but flexible; colour yellowish-white (in spirit). Tentacles 20, round, with stumpy digits; mouth ventral; anus terminal and without teeth. The middle ambulacrum of the trivium bears a double row of feet; outside these the skin is thrown into longitudinal and transverse folds and ridges; the skin on the dorsum is also ridged.

The lateral ambulacra possess a single row of feet much longer than those on the middle ambulacrum. Just above this row of feet there is a row of long, pointed processes; these average 15 mm. in length. The dorsal ambulacra are furnished with a double row of processes; these are shorter than the lateral ones. One polian vesicle; one stone canal; one bundle of genital tubes which are branched and furnished with irregular dilatations. Calcareous ring small; muscles poorly developed relatively to the size of the animal.

The calcareous bodies consist of large, round, many-holed plates, the centre holes being fairly large, the marginal ones small. Besides these plates, a few branched spicules are present.

This species is very closely allied to *P. moseleyi*, Théel.

Numerous specimens.

January 2nd, 1888, off Port Blair, 271 fathoms, bottom green mud (*Giles*).

April 12th, 1888, 7½ miles E. of N. Cinque Island, Andaman Sea, 490 fathoms, bottom green mud (*Wood-Mason*).

Station 115, December 9th, 1890, Andaman Sea, lat. 11° 31′ 40″ N., long. 92° 46′ 40″ E., off Dyer Point and N. of Cinque island, 188—220 fathoms, green mud, bot. temp. 56° (*Alcock*).

AMPHIGYMNAS, nov. gen.

Body ovoid with narrow tail-like extremities; soft and appears to have been surrounded by a jelly-like material when fresh. Feet very numerous over the whole of the trivium and placed more or less irregularly. Lateral margins with two or three rows of long processes. Back covered with processes except near the mouth and anus where the body tapers and where the dorsal surface is naked; mouth terminal, small; tentacles 15, very small and retracted; anus terminal, small. Calcareous bodies moderate sized, irregularly rounded, many-holed plates somewhat like those of *Pannychia*. Calcareous ring of 5 small pieces loosely connected.

7. AMPHIGYMNAS MULTIPES, n. sp.

Length 80 mm., width near middle of body 22 mm.; at oral and anal end about 9 mm.

Colour (in spirit) pale purple; the long lateral processes measure about 15 mm., those on the back are shorter.

One specimen.

Station 115, December 9th, 1890, Andaman Sea, lat. 11° 31′ 40″ N., long. 92° 46′ 40″ E., off Dyer Point and N. of Cinque island, 188—220 fathoms, green mud, bot. temp. 56° (*Alcock*).

8. LÆTMOGENE SPONGIOSA, Théel, l. c., p. 80.
Crydora spongiosa, Théel, Prelim. Rep. Hol., p. 9.

One specimen.

April 17th, 1888, Bay of Bengal, lat. 10° N., long. 91° 7′ E., 1924 fathoms (*Wood-Mason*).

Family Psychropotidæ.

9. EUPHRONIDES DEPRESSA, Théel, Chall. Rep. vol. iv, Hol., p. 93.

Two specimens.

Station 118, December 15th, 1890, Bay of Bengal, lat. 12° 20′ N., long. 85° 8′ E., 1803 fathoms, globigerina ooze with pieces of pumice, bot. temp 35° (*Alcock*).

10. BENTHODYTES PAPILLIFERA, Théel, l. c., p. 102.

"Colour purple, tentacles violet black" (*Alcock*).

Two specimens 80 mm. and 68 mm. The fringe is damaged and the dorsal papillæ are not very apparent, but there is, I think, no doubt that these specimens belong to Théel's species.

Station 117 (*Alcock*).

11. BENTHODYTES SANGUINOLENTA, Théel, l. c., p. 104.

Four specimens; the row of transverse papillæ below the mouth cannot be made out.

Station 118 (*Alcock*).

12. BENTHODYTES OVALIS, n. sp.

Length 65 mm.; breadth 35 mm. including fringe. Body oval, flat, about twice as long as broad and of a deep purple colour throughout. A double row of feet on the middle ambulacrum of the trivium and no transverse line of feet below the mouth; lateral ambulacra with a single row of feet. On the dorsal surface there are three processes on each ambulacrum; the anterior ones are 15 mm. long and not retractile (?); the posterior one in each row is much smaller. Mouth ventral; anus terminal. Tentacles retracted. Calcareous bodies small 3-armed spicules with the end of each arm clubbed and perforated.

One specimen.

April 12th, 1888, 7½ miles E. of N. Cinque island, Andaman Sea, 490 fathoms, bottom green mud (*Wood-Mason*).

13. BENTHODYTES GELATINOSA, n. sp.

Before describing the specimens as they appear in spirit it will be better to quote the graphic account of the fresh creature given by Dr. Giles, Ad. Rep. Marine Survey of India, 1877-88, p. 15:—

"I must first notice a very peculiar holothurian, several specimens of which were included in the catch......... When fresh, the animal consists of a tough, muscular sac of a yellowish pink colour, enclosed in a thick coating of perfectly transparent, deep violet jelly. Though not sticky or glairy, this jelly is of so delicate a consistence that it was almost impossible to clean the mud from the animal without stripping off the coating. After a short exposure to the action of spirit, this jelly, previously fully 15 mm. thick, shrinks to a thickness of less than 5 mm. and becomes comparatively dense. The violet colouring matter dissolves out into the spirit and exhibits a curious affinity for vegetable tissues, deeply staining a paper label which had been placed within the jar. Its attraction for animal tissues though less marked was still very noticeable, the nuclei shewing it best, so that, on microscopical examination, the animal was found to have become stained in a solution of its own pigment. After hardening in spirit it is sufficiently evident that this jelly-like coating cannot be considered as a secretion, but as an integral part of the tissues of the body wall, as it consists of a plexus of stellate and spindle-shaped cells, enclosing within their meshes many nuclei-form bodies and much hyaline connective substance. The body wall contains but few calcareous bodies. Those present consist of a circular plate, having articulated to it a fan-shaped body so shaped that the whole apparatus is not unlike the badge of a grenadier's cap. As far as could be made out, these bodies appertain to the jelly-like layer and not to the dense inner portion of the body wall, which latter appears to be purely muscular. When laid open it is seen that the lungs are very complex and racemose, and that the ambulacral tubes which are very small and straight, give off a number of minute branches to the pedicels. The polian vesicle is of moderate size and simple. It appears to belong to, or be near, the genus *Benthodytes* of the *Elasipod* family *Psychropotidæ*, and is doubtless new as it is identifiable with neither of the species in the Challenger monograph. In all probability, many of its allies must share with this species the peculiarity of a jelly-like coating but no mention of any such appearance is made in the above report."

Length of specimens 100 to 140 mm.—Body soft; extremities and ventral feet are still of a beautiful purple, the body generally is a dark lavender colour (in spirit). The anterior end of the body has a wide lappet-like fringe furnished with papillæ and the border is continued down each side of the flatly cylindrical body and expanded in a less pronounced form as an anal lappet. Along the lateral border there are numerous feet in a single row. Mouth small and ventral; anus large, patulous and somewhat dorsal, situated just above the anal lappet.

Tentacles 15, very small and of a deep purple colour. One, or two, fairly large Polian vesicles ; calcareous ring very minute, a double row of sucker feet on the middle ambulacrum of the trivium ; these are more numerous and closer together near the anal end while they are entirely absent from the surface just below the mouth. A single row of fairly long, slender retractile papillæ are seen on each dorsal ambulacrum. Two small bundles of genital tubes. The longitudinal muscles are well-developed, broad, orange-yellow and visible through the skin—only a few calcareous spicules and granules were found in the muscular substance of the body.

Many specimens.

January 2nd, 1888, Andaman Sea off Port Blair, 271 fathoms, (*Giles*), two specimens.

April 12th, 1888, Andaman Sea 7½ miles E. of N. Cinque island, 490 fathoms, (*Wood-Mason*). Two specimens.

Station 115, December 9th, 1890, Andaman Sea, lat. 11° 31′ 40″ N., long. 92° 46′ 40″ E., off Dyer Point and N. of Cinque island, 188—220 fathoms, green mud, bot. temp. 56° (*Alcock*). Eleven specimens.

APODOGASTER, nov. gen.

Body long flat and worm-like ; slightly wider anteriorly than posteriorly. Down both sides there is a fringe, like that of *Benthodytes*, in which are seen the long tubes of numerous sucker feet. The odd ambulacrum is naked while the lateral ambulacra have one row of small sucker feet situated just below the lateral fringe. A single row of papillæ on each dorsal ambulacrum. Tentacles 15, mouth ventral. Anus terminal.

Calcareous bodies small granules and small wheel-like plates.

14. APODOGASTER ALCOCKI, n. sp.

Length 80 mm.

"Light pink" (*Alcock*).

One specimen.

Station 112, November 7th, 1890, Bay of Bengal, lat. 13° 47′ 30″ N., long. 92° 36′ E., 561 fathoms, grey mud, bot. temp. 44·9° (*Alcock*).

Order APODA.

Sub-order PNEUMONOPHORA.

Family **Molpadidæ.**

15. ANKYRODERMA DANIELSSENII, Théel, Chall. Rep. vol. xiv, Hol. p. 39.

One specimen.

April 11th, 1888, 7 miles S. E. by S. of Ross Island, Andaman Sea; 265 fathoms, green mud (*Wood-Mason*).

16. A. MARENZELLERI, Théel, l. c., p. 41.

One specimen.

Station 55, 13th—14th April, 1889, Bay of Bengal, 30 miles W. of Middle Andaman Island (Cape Bluff), 480—500 fathoms, globigerina ooze (*Alcock*).

17. EUPYRGUS SCABER, Lütken, Videnskab. Meddel. Kjöbenhavn 1857, p. 23.

After some indecision as to the correct title of these specimens I have thought it better to name them as above. In general form and appearance they all agree with *Echinosoma hispidum*, Semper, Reis. in Philipp. 1867, p. 44, but differ from *Eupyrgus hispidus*, Barrett, Ann. Mag. Nat. Hist. xx, p. 46, which Semper gives as a synonym of his *Echinosoma*, in having no sucker feet. In the Challenger Report, vol. xiv, Hol. p. 49, *Echinosoma hispidum*, Semp. is given as a synonym of *Eupyrgus scaber*, Lütken, and the *Eupyrgus* of Barrett is not mentioned.

Three specimens.

January 15th, 1888, off Cinque island, Andaman Sea, 650 fathoms (*Giles.*)

Station 107, October 23rd, 1889, Laccadive Sea, lat. 8° 23′ N., long. 75° 47′ E., 738 fathoms, green mud, bot. temp. 41·9° (*Alcock*).

Station 116, December 9th, 1890, Bay of Bengal lat. 11° 25′ 5″ N., long. 92° 47′ 6″ E. off Cinque and Rutland islands, 405 fathoms, green mud, bot. temp. 47° (*Alcock*).

18. TROCHOSTOMA ANDAMANENSE, n. sp.

This species is very closely allied to *T. antarcticum*, Théel, Chall. Rep. vol. xiv, Hol. p. 44.

Length 90 mm.

Body cylindrical and narrowed behind into a tail-like extremity. Skin rough but thin. In spirit the ground colour has become greenish-grey and the spots are more or less blood-red. The tentacles fifteen in number, are yellow and between every two there is, near the base, a blue-black triangular mark. Each tentacle has three very small digits at the free end. Mouth and anus terminal, the latter without teeth, but in one specimen with numerous fine papillæ. One Polian vesicle, one free stone canal; 2 (3 ?) lungs, not much branched; one bundle of yellow genital tubes. The radii of the calcareous ring are produced backwards as spines. Calcareous bodies not very numerous consisting of a few wide-holed plates and tower like rods which are perforated with 4 to 6 holes. Under the microscope the "chocolate spots" are seen to be composed of rust-red ovoid bodies with a concentric arrangement. They are insoluble in caustic potash.

Colour when fresh "dirty flesh-colour with closely placed deep chocolate spots; the crown (tentacles) being a sort of raw-meat-colour." (*Giles*).

Three specimens.

December 8th, 1887, S. E. of Cinque island, Andaman Sea, 500 fathoms, green mud (*Giles*).

VII.—*On an undescribed Oriental species of* Nepeta.—*By* D. Prain.

[Received 2nd March 1891;—Read 6th May 1891.]

(With Plate III).

In the Calcutta herbarium there is an example of a very distinct species of *Nepeta* which appears to be as yet undescribed. As it has been collected beyond the frontiers of India, it could not with propriety be dealt with in the paper on *Indian Labiatæ* recently read before the Society. But as it possesses rather more interest than isolated new species usually do, its position in the arrangement of Oriental species elaborated by the late M. Boissier in his work (*Flora Orientalis*, iv, 637-670) dealing with the area in which it occurs, as well as a description and figure of the specimen, are now presented.

NEPETA Linn.

Sect. I. Eunepeta. Series I. Perennes. *Sub-ser.* 2. Nuculæ tuberculatæ.

§ Macrostegiæ *Boiss., Flor. Orient.* iv, 638 (1879) *ampl.*—Verticillastra densiflora vel laxiuscula remota. Bracteæ ovatæ vel oblongæ. Calyx fauce pilosus vel glaber.

1. Calyx ore obliquus.
   - *a.* Calyx fauce pilosus.

N. Bellevii.

   - *b.* Calyx fauce glaber.

N. glomerulosa, N. juncea.

2. Calyx ore rectus, fauce glaber.

N. Scordotis, N. Sibthorpii, N. leucostegia.

34 *b.* Nepeta Bellevii *Prain*; robusta, laxe lanata nivea, caulibus elongatis ramosis puberulis obtuse 4-gonis superne subnudis, *foliis* majusculis sursum decrescentibus oblongo-lanceolatis crenato-dentatis

subrugosis apice acutis basi truncatis, utrinque parce lanatis, inferioribus breve petiolatis cæteris subsessilibus ramealibus ovato-lanceolatis; *verticillastris* multifloris laxiusculis remotis, *bracteis* membranaceis ovato-lanceolatis acuminatis cucullatis calyces æquantibus, *calycis* longe hirsuti membranacei striati ore intus piloso obliquo, dentibus e basi angustiore subulatis summo tubum subæquante cæteris eo brevioribus, *corolla* extus puberula tubo calycis fere 2-plo longiore, staminibus exsertis, *nuculis* oblongis apice obtusis ruguloso-tuberculatis areolâ ferri equini calcaribus sursum directis ad instar affixis.

AFGHANIA AUSTRALI; inter Kandahar et Kelat-i-Ghilzai, *Bellew!*

Rhizoma de-est, caulis p. q. s. plus quam 40 cm. basi fere 1 cm. crassa, foliis inferioribus 7—9 cm. longis his 3—4 cm. latis petiolis 1 cm. longis, ramealibus 2—2·5 cm. longis his 1—1·5 cm. latis sessilibus, *spicâ* 12 cm. longâ hac 2·5 cm. latâ verticillastris (10—12) 12—16-floris imis 2 cm. summis vix 1 cm. remotis, bracteis 12 mm. longis 4—7 mm. latis 3—5-nervis coloratis supra glabris subtus nervis sub lente puberulis margine prope basin parce pilis albis divergentibus ornato prope apicem acuminatum et tandem subulatum sub lente puberulo, *calyce* tandem subinflato pedicello 1—2 mm. longo tubo 6 mm. longo dentibus summo 6 mm., lateralibus 5 mm., imis 4·5 mm. longis extus æquabiliter pilis albis divergentibus parce hirsuto intus tubi ore et dentium basibus pilis simillimis densissime piloso, *corolla* tubo 11 mm. longo extus puberulo colore forsan rosea, *nuculis* 3 mm. longis his 1·5 mm. latis brunneis areolâ albâ calcaribus 1 mm. longis exceptâ manifeste rugulosis.

This very distinct species bears a considerable resemblance to the European *N. tuberosa* but the whorls are much more lax, the calyx mouth is oblique and no secondary reticulation of the membranous bracts is visible. The nutlets of this species also closely resemble those of *N. tuberosa* and *N. Sibthorpii*, but in these European species there is a much smaller areola of the usual type. Among Oriental species it most resembles *N. glomerulosa*, next to which it is now placed, but it differs greatly in having much larger bracts, much longer spikes and many-flowered lax whorls with longer corollas. The nutlets too are different—the horse-shoe shaped areola of the nutlets being perhaps the most remarkable character of this species; its pilose calyx-mouth also is a character which connects it with § PSILONEPETÆ *Benth.* to which group this feature has hitherto been supposed to be confined. Except for this character, however, it is much more obviously related to the other MACROSTEGIÆ than to any PSILONEPETA. Perhaps a preferable view would be to look on this species as the type of a new subsection intermediate between Psilonepetæ and Macrostegiæ though to be

placed in the same subseries as the latter. This subsection would be characterised as follows:—

§ PSILOSTEGIÆ (*Sub-sect. nov.*).—Verticillastra laxiuscula remota. Bracteæ ovatæ. Calyx fauce pilosus. (Nuculae tuberculatae).—Inter PSILONEPETAS *Benth.* et MACROSTEGIAS *Boiss.* quasi mediantes et proximæ MACROSTEGIIS (*Boiss., Flor. Orient.* iv, 638 et 651) anteponendæ.

EXPLANATION OF PLATE III.

NEPETA BELLEVII, Prain.

Fig. 1. Bract.
2. Calyx.
3. The same, laid open.
Fig. 4. Corolla tube.
5. Upper lip of Corolla.
6. Nutlet, external aspect.
7. The same, showing inner face with characteristic horse-shoe shaped *areola.*

VIII.—Noviciæ Indicæ. IV. *Two additional species of* GLYPTOPETALUM.—

By D. PRAIN.

[Received 20th April, 1891;—Read 6th May, 1891.]

In a collection of plants from Great Coco, an island thirty miles north of N. Andaman, are complete examples of a species of *Glyptopetalum* nearly related to *G zeylanicum*, Thw. This plant was previously collected, but only in fruit, either in Tenasserim or the Andamans by Helfer* and an example of the gathering (Helfer n. 1973) was described by Kurz in this *Journal* (vol. xli, [1872], pt. 2, p. 299) as *Euonymus calocarpus*, Kurz. The same plant (specimens also incomplete) has been reported from Kondil (Nicobars) by Calcutta garden collectors, and this gathering, along with a plant from Great Nicobar (Novara 188, Jelinek 245; not represented at Calcutta), has been referred by Kurz in this *Journal* (vol. xlv, [1876], pt. 2, p. 123) to *Euonymus javanicus* Blume.*

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* This gentleman, as members are aware, was assassinated in North Andaman; his collections were disposed of in Europe and distributed thence; the circumstances of his decease rendered it impossible to differentiate positively his Tenasserim from his Andamans specimens. Kurz believed this gathering (n. 1973) to be from Tenasserim, and Lawson (*F. B. I.* i, 612) gives the same locality; I am not aware, however, what authority these authors had for this definite decision, the *Herb. Calcutta* specimen on which Kurz based his description yields none.

As it is necessary to formally remove the plant from the genus to which it has hitherto been referred† the opportunity has been taken of providing a full description; at the same time a description is given of a second species collected—in fruit—in the Mishmi Mts. by Griffith; a synopsis of all the species now known precedes these descriptions.

In the four species of which the fruit is known, the dorsal raphe does not terminate at the organic base of the seed but there divides into 3-4 laciniate segments of the same appearance and consistence as the raphe itself; from the raphe they only differ in being slightly branched and in not quite reaching the hilum. They form a closely adherent

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* No opinion can be expressed here regarding the Novara expedition specimens; no example of *E. javanicus* has hitherto been obtained in the Nicobars by Calcutta collectors.

† It is true that Kurz did not think *Glyptopetalum* Thw. generically separable from *Euonymus* Linn. for in this *Journal* (vol. xliv, [1875], pt. 2, p. 259) he formally relegates it to *Euonymus* (as a section) and in the *Forest Flora of British Burma* (vol. i, [1877], p. 249) he does not accord *Glyptopetalum* even sectional rank. It must also be pointed out that Bentham and Hooker had already (*Gen. Pl.* i, [1862], p. 361) pointed out how slight are the characters—the principal one being the solitary pendulous ovules—that separate *Glyptopetalum* from *Euonymus*; Baillon also (*Hist. des Plantes*, vi, [1875], p. 1, *footnote*) takes the same view as Kurz. If therefore the views of Kurz and Baillon ultimately prevail this plant will again be known as *Euonymus calocarpus* Kurz.

But while this is the case it will be seen on referring to the place of its publication that Kurz did not recognise in this species an example of his own section *Glyptopetalum*. In the *Flora of British Burma* too the generic description of *Euonymus* given by Kurz implies that the cells of the ovary are at least 2-ovuled—an implication opposed to his own statement (*J. A. S. B.* xliv, pt. 2, 159) as regards *Glyptopetalum sclerocarpum* and, as regards the species under review, incorrect. Kurz's views regarding the generic position of *Glyptopetalum* may therefore, I think, be ignored, and Baillon's authority can hardly be quoted in Kurz's support since that author takes so comprehensive a view of *Euonymus* that he is prepared to merge in it not merely *Glyptopetalum* Thw. but also *Lophopetalum* Wight, a step which Kurz has nowhere proposed. Moreover the genus *Glyptopetalum*, as founded by Thwaites (*Hook., Jour. Bot.* viii, [1856], p. 267), is sustained by Bentham and Hooker (*Gen. Pl.* i, [1862], p. 361), by Hooker and Thwaites (*Enum. Pl. Zeylan.* [1864], p. 73), by Beddome (*Flor. Sylvat.* i, [1874], t. 102), by Lawson (*Flor. Brit. Ind.* i, [1875], p. 612), by Trimen (*Cat. Ceylon Pl.* [1885], p. 18) and by Durand (*Index Gen. Phaner.* [1888], p. 66); considering too the large number of species of *Euonymus* proper already described and the ease with which species of *Glyptopetalum* are distinguished from these, it appears inadvisable at present to follow Kurz and Baillon in suppressing the latter genus. The present retention of *Glyptopetalum* moreover disturbs the synonymy of only one species instead of changing that of several.

arillar structure with meridional segments differing in colour from the testa that it overlies. The presence of this arillus proves that the coloured "aril" (which in turn loosely overlies it) is not a *true arillus* but, as Planchon has pointed out as regards the aril of *Euonymus*, an *arillode*.

GLYPTOPETALUM Thwaites.

Characters of *Euonymus* but ovules solitary and pendulous from the apex of the cell.

- *Cymes shorter than leaves, flowers under 20 mm. diam.* :—
  - *Fruit quite smooth* :—
    - *Peduncles ½ as long as leaves, cymes lax 2-3 times divided*; leaves thinly coriaceous oblong-lanceolate serrate, petals oblong, flowers 12 mm. diam., arillode covering ¾ of seed and lobed at the margin ... ... 1. *G. zeylanicum.*
    - *Peduncles very short, cymes dense* 1-2 *times divided* :—
      - *Cymes longer than petioles, peduncles longer than pedicels*; leaves coriaceous ovate-oblong entire, nerves indistinct, petals oblong, flowers 8 mm. diam., arillode covering ⅔ of seed and lobed at the margin ... 2. *G. calocarpum.*
      - *Cymes not exceeding petioles, peduncles shorter than pedicels, leaves membranous*, ovate-oblong serrate, nerves prominent beneath, arillode hardly covering ⅓ of seed, margin entire... 3. *G. Griffithii.*
  - *Fruit rough tubercular*; peduncles ½ as long as leaves, cymes lax 2-3 times divided, leaves thickly coriaceous, oblong-lanceolate serrate, petals suborbicular, flowers 8 mm. diam., arillode covering ½ of seed, margin sinuate... ... ... 4. *G. sclerocarpum.*
- *Cymes longer than leaves, flowers over 20 mm. diam.*; cymes lax once divided, leaves thinly coriaceous, oblong-elliptic entire, petals obovate, flowers 30 mm. diam.; fruit unknown ... ... 5. *G. grandiflorum.*

1. GLYPTOPETALUM ZEYLANICUM *Thwaites.* (*F. B. I.* i, 612).
INDIA AUSTRALIS; ZEYLANIA.

2. GLYPTOPETALUM CALOCARPUM.—(Euonymus calocarpus *Kurz, Jour. As. Soc. Beng.* xli, ii, 299 (1872) et xliv, ii, 159 (1875); *Laws.* in *Hook. f., Flor. Brit. Ind.* i, 609 (1875); *Kurz, For. Flor. Brit. Burma* i, 249 (1877).—E. javanicus *Kurz, Jour. As. Soc. Beng.* xlv, ii, 123 [*Veg. Nicobar.* 19] (1876), *saltem in parte, haudquaquam* E. javanicus *Blume.*)

TENASSERIM ?; *Helfer* (n. 1973). N. ANDAMANS; Great Coco, Little Coco, Table island, *Prain.* NICOBARS; Kondil, *Calcutta garden collectors.*

Arbuscula glabra ramulis glabris teretibus, *foliis* coriaceis supra viridibus subtus prasinis elliptico-oblongis utrinque cuneatis apice obtusis margine integris nervis 5—6-paribus indistinctis, petiolis brevibus; *cymis* axillaribus vel parum extra-arillaribus paucifloris densioribus pedunculis semel rarius iterumque divisis; pedicellis brevibus; floribus parvis albo-viridescentibus, *calyce* 4-lobo lobis omnibus rotundatis exterioribus interioribus 2-plo minoribus, *corollæ* petalis 4 oblongis obtusis planis prope basin 2-foveolatis; *staminibus* 4 filamentis erectis in disci angulis obtusis insertis, loculis antherarum basi divergentibus; *ovario* pyramidato-tetragono disco affixo stigmate minuto, 4-loculare; ovulis in loculis singulis pendulis anatropis, raphi extrorsa; *capsula* 1—4-sperma rotundata loculicidim dehiscente, *seminibus* oblongis pendulis, arillo laciniato in testa membranacea adhaerente e raphi orto ornatis et arillodio carnoso rubro obtectis; *embryone* intra albumen carnosum orthotropo, cotyledonibus oblongis foliaceis, radicula brevi.

Arbuscula 4—12 metr. alta, *foliis* oppositis 9—16 cm. longis his 6—9 cm. latis, petiolis ·75 cm., *cymis* 3—9-floris pedunculis 20—30 mm. longis, pedicellis ·4 mm. longis, *sepalis* exterioribus 1·5 mm. interioribus 3 mm. diam., *petalis* 3 mm. longis latisque, *capsulis* extus viridibus intus pallidis 1 cm. longis his 1—2 cm. latis *seminibus* 8 mm. longis his 7 mm. latis testa aurantiaca, arillo pallido, arillodio rubro 6 mm. alto.

Differs from *G. zeylanicum* by its rounded branches, thicker broader leaves with margins entire, by its much smaller flowers with petals flat and not reflexed at the margin, and by its rather shallower arillode. The true arillus is identical in both and the margin of the arillode is similarly lobed.

3. GLYPTOPETALUM GRIFFITHII.

In montibus MISHMI; *Griffith* (n. 1996).

Arbuscula ? glabra ramulis glabris sub-4-gonis, *foliis* membranaceis læte-virentibus, elliptico-oblongis apice acuminatis basi cuneatis margine parce et minute dentatis, nervis 6—7-paribus subtus prominentibus, petiolis distinctis; *cymis* axillaribus paucifloris densis pedunculis semel divisis, pedicellis elongatis; *floribus* ......; *capsula* 1—4-sperma rotundata loculicidim dehiscente; *seminibus* oblongis pendulis basi tantum arillodio carnoso obtectis; *embryone* intra albumen carnosum orthotropo, cotyledonibus oblongis foliaceis, radicula brevi.

Arbuscula? *foliis* oppositis 10—15 cm. longis his 6—9 cm. latis, petiolis 1 cm. longis, *cymis* 3-floris pedunculis 2—4 mm. longis pedicellis 8—9 mm. longis, *sepalis* omnibus 2·5 mm. diam., capsulis extus læteviridibus intus pallidis 1 cm. longis his 1—2 cm. latis seminibus 8 mm. longis his 7 mm. latis, arillodio 2·5 mm. alto.

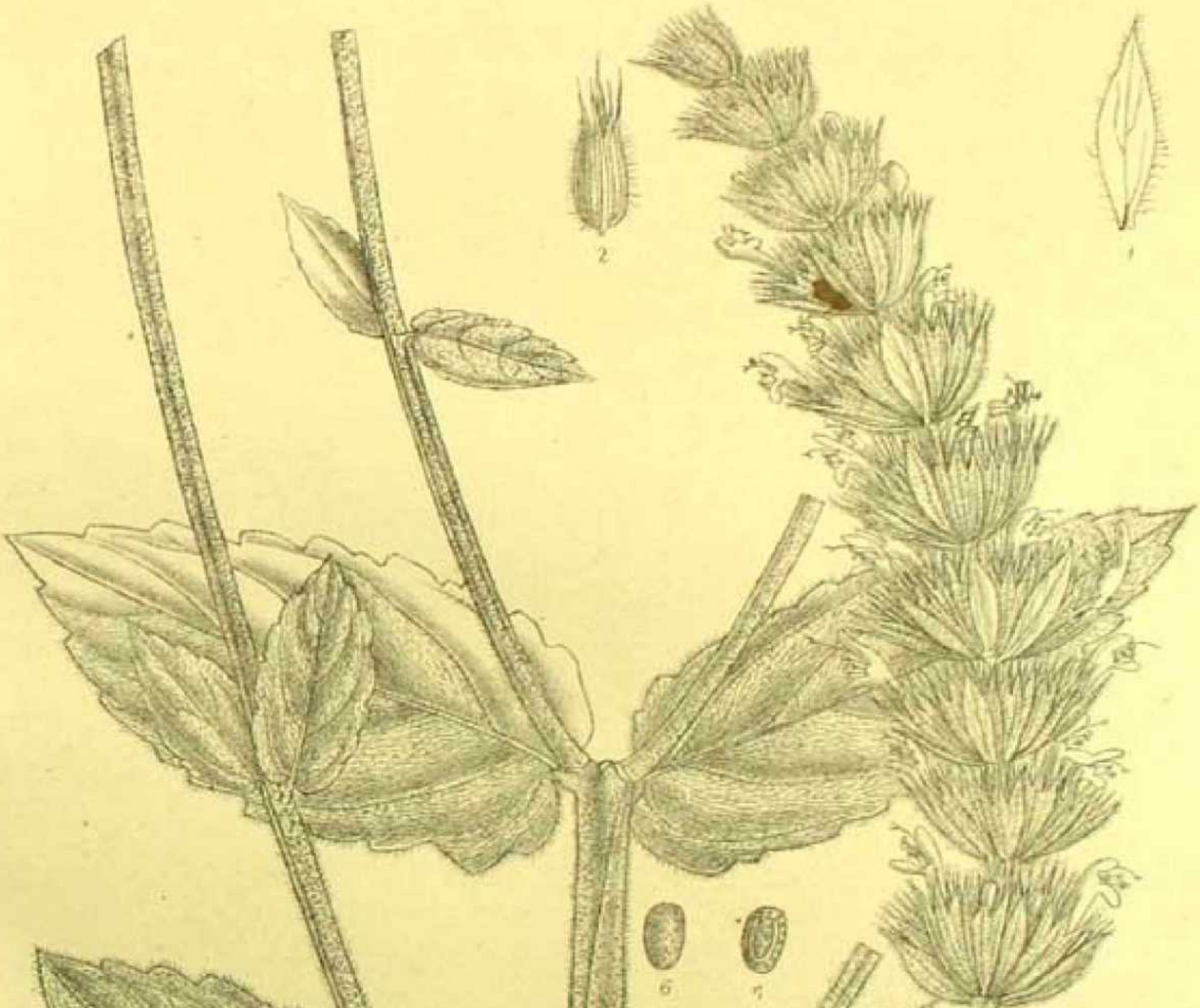
This species is well distinguished by its very short cymes with peduncles shorter than the pedicels and by its much shallower arillode. The sepals are all of equal size, the capsules externally are not distinguishable from those of *G. zeylanicum*.

4. GLYPTOPETALUM SCLEROCARPUM *Kurz*. (*F. B. I.* i, 613).
PEGU.

5. GLYPTOPETALUM GRANDIFLORUM *Beddome*. (*F. B. I.* i, 613).
INDIA AUSTRALIS.

PRAIN, Journ. Asiat. Soc. Bengal, Vol. LX. Pt. II. 1891.

Pl. III.



K. P. Dass delt.

A. D. Molla, sc.

NEPETA BELLEVII Prain.

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Part II.—NATURAL SCIENCE.

No. III.—1891.

IX.—*Additional* Uredineae *from the Neighbourhood of Simla.*

By A. BARCLAY, M. B., *Bengal Medical Service.*

[Received 12th June, 1891; Read 1st July, 1891.]

(With Plates IV and V.)

Since the completion of my Descriptive List of the Simla *Uredineae*, published in former volumes of the Journal of this Society I have found, or have been supplied with, 32 other species, which are described in the following pages. Of these 32 species, 4 are *Uromyces* (2 new), 11 *Puccinia* (5 new), 3 *Phragmidia* (all new), 1 *Xenodochus* (new), 2 *Melampsora* (1 new), 5 isolated Aecidial Forms (3 probably new), and 6 isolated Uredo Forms (5 probably new). Of the 32 species described, therefore, probably 20 are new.

HEMIUROMYCES.

UROMYCES VIGNAE, n. s.

On *Vigna vexillata*, Benth.

I found this plant (on Tara Devi) towards the end of August immensely attacked by a species of Uromyces. The leaves were sometimes almost blackened with pustules. These were irregularly scattered over the leaf blade on both surfaces, but more freely over the lower surface; and it appeared to me probable that they first emerged from this surface, and later from the upper surface, at a more advanced stage. Each pustule was round and convex, and without any paling of tissue around. On a few of the younger leaves I found some paler brown uredo pustules, on both surfaces of the leaf. Except in colour they were similar to the teleutospore pustules.

The *uredospores* are brownish red, oval to round, thin walled, very spiny, and with a few immature teleutospores among them (Pl. V, fig. 19). They measured when fresh and just wetted $26-19 \times 19-18\mu$.

The *teleutospores* are deep brown, oval, very deciduous, with a portion of colourless stalk adherent, with a pale brown shallow mammilla at the free end, a clear nuclear vesicle, a germ pore just under the mammilla, and a smooth surface (Pl. V, fig. 19). The fresh spores just wetted measured $35-27 \times 22-20\mu$. The portion of adherent stalk measured up to 40μ in length. These spores refused to germinate, probably requiring a period of rest. But some uredospores germinated throwing out simple long unbranched tubes.

As this host is nearly related to *Lathyrus sativus*, I at first thought the fungus must be the same as that I have described elsewhere[*] on that plant, namely, *Uromyces Pisi*, Pers.; but the uredospores of the fungus on Vigna are considerably smaller, whilst the teleutospores are larger. It is therefore probable that the species I have here described is different, and I have named it *Uromyces Vignae*.

UROMYCES AGROPYRI, n. s.

On *Agropyrum*, sp.

This grass was collected also by Mr. Lace at Ralli (Bashahr), 7,000 feet, in October.

On some leaves there were light brown pustules on both leaf surfaces, and these contained uredospores. Other pustules were long, linear and black on the under leaf surface, somewhat resembling pustules of *P. graminis*.

The *uredospores* are round to oval, pale brown, densely warted, with several germ pores (4 to 5), and measured when just wetted $23-20 \times 21-19\mu$.

The *teleutospores* are lightly adherent to their beds, coming off with a small piece of stalk attached. They are light yellowish brown, much thickened at the apex, smooth on the surface, with a clear nuclear vesicle, measuring when just wetted $37-28 \times 18-16\mu$.

Hitherto, so far as I am aware, this genus of grasses was known to harbour only two species of *Puccinia* (*P. graminis* and *P. coronata*). This is therefore probably a new species.

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[*] Journal of Botany, Sept. 1890.

UROMYCES PULVINATUS, Kalchb. et Cooke. ?

On *Euphorbia hypericifolia*, Linn. var. *indica*.

Mr. Lace collected a *Puccinia* on this species of *Euphorbia* in October in a low valley of Bashahr, about 6,000 feet above the sea level. The under-surfaces of the leaves were profusely covered with dark brown circular pustules, usually distinct from one another, but sometimes coalescing. The spores are readily scraped off. These consist of:—*uredospores* which are yellow, thin-walled, spiny, and $20 \times 19\mu$.; and *teleutospores*. These are small, brown, thick-walled, single-celled, with a small piece of stalk adhering (sometimes none), warted on the surface, and generally with a clear nuclear vesicle. When just wetted they measure $21-17 \times 18-16\mu$.

Of the several species of *Uromyces* which inhabit species of *Euphorbia* the one I have just described comes nearest *U. pulvinatus*, Kalchb. et Cooke, and *U. Myristica*, B. et B. The former has been described from South Africa, and the latter from North America. In size of spore the Himalayan fungus resembles the former more than the latter; but the spores of *U. pulvinatus* are smooth, whilst those of *U. Myristica* are punctated like mine.

MICRUROMYCES or LEPTUROMYCES.

UROMYCES AMBIENS, Cooke.

On *Buxus sempervirens*, Linn.

Specimens of this fungus were gathered by Mr. Lace in the Bhabar Valley, Bashahr (6,000 feet) in October. The leaves were studded with circular patches 1—4 mm. in diameter. Some of these were orange yellow, and others pale in the centre, but surrounded by a black circle. The centres of all patches contained very prominent papillae (spermogonia ?). All the pustules were hypophyllous. In the case of patches which were not black the central papillae were surrounded by a circular mound covered with epidermis. This mound was a circular covered spore pustule. The spores were orange red, but as they were thick walled and otherwise like immature teleutospores I do not regard them as uredospores. The black circles surrounding the other patches were naked teleutospore beds. The spores from such parts are large, yellowish brown, round to oval, fairly firmly adherent, coming off usually with a short stalk or none, thick walled, showing a distinct pore at the summit which is not thickened. Their surfaces were smooth, and they measured when just wetted 44 – 40 × 36 – 34μ.

This is doubtless *Uromyces ambiens*, but I have no access to the measurements of the spores. Cooke's specimens apparently came from the Himalayas.

HEMIPUCCINIA.

PUCCINIA SORGHI, Schw.

On *Zea Mays*, Linn.

I had long searched in fields of maize for a Uredine, but without success until 1890 when I found it in some fields at Mashobra. Up to this time I was acquainted with the fungus only on *Sorghum vulgare*, on specimens of the plant sent to me for examination from the Poona district. But this is absolutely the first record of its existence on maize in India, so far as I am aware. My specimens were gathered early in October. Pustules were found abundantly on both leaf surfaces, some covered entirely with a scale of epidermis, whilst others were more or less naked. The covered pustules contained uredospores, the naked ones mostly teleutospores, and the perfectly matured open ones, which are inky black, only teleutospores. Some pustules were minute and circular, others long and even linear.

The *uredospores* are pale brownish red, round to oval, beset with shallow warts or short spines, and measure when just wetted 30 – 26 × 26 – 20μ. By applying sulphuric acid I detected 3 germ pores in each spore, arranged around the short equator.

The *teleutospores* are firmly attached, breaking off with a portion of stalk adhering. They are reddish brown, rounded at both ends, thickened at the free end, constricted at the septum, and apparently smooth on the surface. When just wetted they measured 42 – 32 × 18 – 16μ. They refused to germinate immediately after ripening. There were no paraphyses.

This fungus is much more like *Pucc. Sorghi* than that which grows on *Sorghum vulgare*, and which I have described elsewhere.* In the first place the fungus on *Zea* has no paraphyses, and in the second the measurements of both uredo- and teleutospores approximate those given for *Pucc. Sorghi* much more closely. In the publication above alluded to I referred the parasite on *Sorghum* with hesitation to *P. Sorghi*. I am now inclined to think that the latter is a different species. Lastly, even later I found a *Puccinia* on *Pennisetum typhoideum*, Rich. (Bajra) at Erode in the Madras Presidency, which is undoubtedly the same as that on *Sorghum.* As neither of these fungi (on *Sorghum* and *Pennisetum*) are Himalayan I shall not describe them in detail here; but in order to enforce my argument that the fungus on *Zea* is *P. Sorghi*, whilst that on *Sorghum* and *Pennisetum* is a different species, which I shall call *Puccinia Penniseti*, I subjoin in tabular form their salient characters.

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* Journal of Botany, Sept. 1890.

Host.	Uredospores.	Teleutospores.	Paraphyses.	Apical thickening.	Germ pores in uredospores.
Pennisetum	34 – 30 × 24 – 2	48 – 44 × 29 – 26	present.	none.	2
Sorghum ...	34 – 30 × 22 – 20	50 – 41 × 29 – 22	present.	none.	4 – 5
Zea ...	30 – 26 × 26 – 20	42 – 32 × 18 – 16	none.	present.	3

PUCCINIA ELLISII, De-Toni ?

On *Angelica glauca*, Edgw.

This plant was found by Dr. G. Watt at Fagoo in August, bearing uredo- and teleutospore pustules, both minute, discrete, and hypophyllous; but whilst the former are pale yellow, the latter are dark brown to black. Both kinds of pustule occurred together on the same leaf.

The *uredospores* are round to oval, very pale yellow, very spiny, and when just wetted 30 – 24 × 25 – 20μ. (Pl. IV, fig. 9).

The *teleutospores* are deep brown, rounded at both ends, slightly constricted at the septum, coming off with little or no stalk adhering, not thickened as a rule at the free end, and tuberculated over both cells (Pl. IV, fig. 9). They are sometimes irregular in shape. They measured when just wetted 38 – 22 × 22μ.

This is possibly *Pucc. Ellisii*, though both the uredo- and teleutospores of this last mentioned species are larger, the former measuring 35 – 30 × 30 – 24, and the latter 40 – 35 × 25 – 20μ. It is certainly not *Pucc. Angelicae*, Schum. which shows a tendency to erupt along the nerves, among other differing characters.

PUCCINIA CASTAGNËI, Thüm ?

On *Apium graveolens*, Linn.

I have hitherto confused a fungus on this host with *Pucc. Pimpinellae*, Strauss; but it is certainly distinct.

The *uredospores* are very pale brown, covered sparsely with spines, and with three germ pores, each covered with a hyaline semilunar thickening, like that described in *Pucc. Prenanthis.* Through each of these a commencing germ tube protrudes, but one only develops fully. They are in pustules mostly hypophyllous, but some few epiphyllous. These uredospores afford another instance of extremely long retained power to germinate. I put some spores scraped off from leaves gathered on the 31st October into water on the 13th June, and found on the following day that many had germinated most freely, although the accompanying teleutospores remained ungerminated.

The *teleutospores* are brownish yellow, very irregular in shape, the septum often oblique, and even perpendicular, slightly constricted at the septum, generally not thickened at the free end, though sometimes slightly so, mostly rounded at both ends, but sometimes with the lower cell narrowing towards the stalk (Pl. V, fig. 18). After lying 24 hours in water these spores measured $41 - 26 \times 24 - 18\mu$.

This is possibly *Pucc. Castagnei*, whose teleutospores are said to be very irregular and to measure $46 - 36 \times 24 - 18\mu$.

PUCCINIA EULALIAE, n. s.

On *Pollinia japonica*, Haeck.

The leaves of this grass presented dark reddish brown linear pustules, mostly on their under-surfaces. These pustules contained uredo- and teleutospores with numerous capitate paraphyses.

The *uredospores* are oval or pyriform, pale brown, and spiny, and measure when just wetted $30 - 28 \times 21 - 20\mu$.

The *teleutospores* are reddish brown: the upper cell is rounded and not thickened specially anywhere; the lower is broadly wedge-shaped. The surface of the spores is smooth, and they usually have a short piece of stalk adhering. They measure when just wetted $38 - 34 \times 20 - 18\mu$. The paraphyses are numerous, reddish brown, capitate, the heads measuring about 16μ. in diameter.

This is probably a new species.

MICROPUCCINIA.

PUCCINIA EXCELSA, n. s.

On *Phlomis lamiifolia*, Royle.

I found this plant early in September on the summit of the Huttoo peak bearing *Puccinia* pustules. I next found it, about the same time at Mahasu, a hill close to Simla. The leaves were densely bespattered on the under surfaces with fairly large, round to oval, dark brown, almost black, circular hemispherical pustules, with a smaller less frequent epiphyllous eruption opposite the beds below. The upper surface of attacked leaves is rendered conspicuous by the yellow zones surrounding the pustules. Pustules were also found on the petiole and smaller stems, though not so frequently.

The *spores* are fairly easily detached, coming off as a rule with no portion of stalk adhering. They are dark brown, somewhat irregular in size and shape, mostly distinctly constricted at the septum, and mostly narrowing towards the free end, where there is a slight pale mammilla or conical thickening (Pl. V, fig. 12). At the base the spore is sometimes rounded, and sometimes narrowed. It is smooth on the surface. The fresh spores examined at once in water measure $40 - 28 \times 18 - 14\mu$.

No uredospores are apparently formed by this species, since I got specimens of teleutospores from the earliest stages of development. The teleutospores would not germinate immediately after ripening.

There is no doubt, I think, that this fungus is distinct from *P. Phlomidis*, Thüm.

LEPTOPUCCINIA.

PUCCINIA USTALIS, Berk. ?

On *Ranunculus hirtellus*, Royle.

I found seedlings of this plant bearing teleutospore pustules on the Mattiana hill on the 4th September. The pustules were quite young, and there was no trace of uredospore. The teleutospore pustules were small, dark, circular, and hypophyllous, with spots of paling on the upper leaf surface. These pustules were confined to the youngest leaves, and were never found on the upper ones. The pustules had a distinct though not pronounced circinate arrangement. The *spores* are very firmly adherent; they are long, more or less spindle-shaped, pale yellowish brown, much thickened and conical at the free end, well constricted at the septum, and narrowing towards the stalk. The surface is smooth (Pl. V, fig. 13). In scrapings I noticed many empty spore cases, and I presume therefore that the species is a *Leptopuccinia*. When just wetted the spores measured $61 - 46 \times 23 - 8\mu$, the apical thickening being $10 - 4\mu$ in depth. I placed some spores in water on the 10th September, and on the following day found some had germinated. The sporidia are oval or somewhat semilunar, colourless, and $13 \times 6\mu$, in measurement. The sterigmata are four in number, short, conical, and pointed, and together with the whole premycelium colourless.

This is possibly *P. ustalis*, Berk.; but I have no access to the spore measurements.

MICRO or LEPTOPUCCINIA.

Puccinia doloris, Speg. ?

On *Erigeron alpinus*, var. *multicaulis*, Wall.

This plant, harbouring a species of *Puccinia*, was gathered by Mr. Lace on the 27th August near the banks of the Sutlej in Bashahr, at an elevation of about 7,000 feet. The under surfaces of the leaves bore numerous large black pustules, irregularly scattered as a rule, but sometimes with several smaller pustules in a circlet around a larger central one. Most pustules were naked, but some were covered over with a scale of epidermis. Though most pustules are hypophyllous some few are on the upper leaf surface.

The *spores* are readily detached, coming off with only a very small fragment of stalk adhering. They are yellowish brown, rounded at both ends, well constricted at the septum, thickened and broadly conical at the free end, beset externally over both cells with shallow short ridges and tubercles, and measuring when just wetted $42-34 \times 18-16\mu$. The thickening at the free end is usually 6μ in depth. I placed them in water in October, but they did not germinate.

This fungus resembles *Pucc. doloris* as described by De-Toni* in many respects, and I have accordingly named it so. But as *P. doloris* is known only, so far as I am aware, from the Argentine Republic, it is quite possible that the Himalayan species is distinct.

Puccinia Saxifragae-micranthae, n. s.

On *Saxifraga micrantha*, Edgw.

Mr. Lace collected this plant, bearing a *Puccinia*, in Bashahr at an elevation of 9,500 feet. On the under leaf surfaces were a number of minute, circular, discrete, brown pustules, sometimes very numerous.

The *teleutospores* are readily detached, and many were found to be empty. The species is probably therefore a *Leptopuccinia*. They are pale brown, not thickened anywhere, with a slight apical mammilla, usually slightly constricted at the septum, but sometimes considerably so, and somewhat irregular in size and shape. When just wetted they measure $35-26 \times 14-12\mu$. I placed these spores in water, but none germinated. There were no uredospores in the specimens sent to me.

This species is quite distinct from *Pucc. Saxifragae-ciliatae* mihi. It is also evidently distinct from *P. Saxifragae*, Schlect.

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* Saccardo, Sylloge Fungorum.

PUCCINIA CAUDATA, n. s.

On *Stellaria paniculata*, Edgw.

Dr. G. Watt collected this plant in Narkanda, bearing a *Puccinia*. The teleutospore beds are dark brown, well raised with a circinate tendency, and hypophyllous, with paled patches on the upper leaf surface. The *spores* are very adherent, more or less spindle-shaped, pale brown, well constricted at the septum, usually much thickened at the apex, with a long piece of adherent stalk (often twice, or a little more, than the whole length of the spore) and measuring $37 - 28 \times 16 - 13\mu$. (Pl. V, fig. 17.).

This is evidently not *P. Arenariae*, Schum. and I have regarded it as a new species.

PUCCINIA CRASSA, n. s.

On *Pimpinella Griffithiana*, Boiss.

This was gathered by Mr. Lace in Ziarat in Afghanistan at 8,000 feet. The teleutospore pustules are dark brown and hypophyllous. The *spores* are brown, almost rounded at both ends, but diminishing somewhat towards the stalk, of which a small fragment remains adherent. They are slightly constricted at the septum, and slightly thickened at the apex (Pl. V, fig. 16). When just moistened the spores measure $50 - 41 \times 24 - 22\mu$. The epispore has shallow tubercles over both cells. They would not germinate.

This fungus is quite distinct from *P. Pimpinellae*, Strauss which is one of the most common of the *Uredineae* in Simla. Neither are the spores like any of the other species inhabiting *Pimpinella* described by De-Toni* (except perhaps *P. Pimpinella*, St var. *Eryngii*, D. C) It is I think a new species.

PUCCINIA PULVINATA Rabenh. ?

On *Echinops niveus*, Wall.

A *Puccinia* on this host was gathered for me by Dr. G. Watt in Simla. The leaves had numerous minute well raised black pustules all epiphyllous. The *spores* are readily detached from their beds. The plant was in full flower inclining to seed. The spores come off sometimes with a long piece of stalk attached, sometimes with a short. The spore surface is studded with shallow tubercles. They are brown, slightly constricted at the septum, mostly rounded at both ends, the free end slightly thickened. Most spores were found empty, so they presumably germinate at once. They measure when just wetted 52 – 45 × 24 – 22μ.

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* Saccardo, *loc. cit.*

This is possibly *Puccinia pulvinata*, though the measurements given by De-Toni are greater than mine (68 – 51 × 38 – 35μ).

PHRAGMIDIUM.

Phragmidium Laceianum, n. s.

On *Potentilla argyrophylla*, Wall.

I first received specimens of this plant harbouring a parasite from Mr. Lace, who gathered them in Bashahr. Subsequently I found specimens myself at Narkanda, and Dr. J. Murray procured specimens at Sarhan in Kulu.

The *uredo pustules* are hypophyllous, brilliantly orange red, discrete, but often so numerous as to give an appearance of coalescence. Each individual pustule is circular and minute. The *spores* are round to oval or pyriform, bright orange red, spiny, and measuring when just wetted 24 – 20 × 18 – 16μ (Pl. IV, fig. 3).

The *teleutospore pustules* are also hypophyllous, black, circular, discrete. The *spores* are deep brown, on stalks which narrow gradually away from the spore. They are mostly five-celled; but some are four and some six-celled. The surface is apparently smooth, the free end rounded and slightly thickened, with usually a minute colourless papilla. When just wetted they measure 132 – 94 × 50 – 41μ. I could not detect any germ pores; and they would not germinate immediately after ripening.

The specimens sent by Mr. Lace, and those collected by myself were on the red flowered variety, whilst those collected by Dr. Murray were on the yellow flowered variety, This fact may tend to confirm the view taken in Hooker's Flora of British India that these two are varieties of the same species.

This fungus is, I think, distinct from any of the three noted in Saccardo's Sylloge as inhabiting species of *Potentilla*. It is not *Phr. Fragariastri, D. C.*, which has warty teleutospores, 75 – 45μ long and 3 – 5 celled. It is not *Phr. Potentillae*, Pers. which has smooth teleutospores, 90 × 26μ, and 3 – 7 celled. And it is not *Phr. Tormentillae*, Fuck. which has spores often bent, 115 × 28μ, 3 – 8 celled, and light brown.

Phragmidium nepalense, n. s.

On *Potentilla nepalensis*, Hook.

I found this host in September attacked with a *Phragmidium* at Mattiana, some miles towards the interior from Simla. The host at that time was in flower and held both uredo- and teleutospore pustules. Both pustules were mainly hypophyllous, but a few (especially uredo pustules) were epiphyllous.

The *uredo* pustules are very brilliantly orange red and circular, but were often so closely aggregated that they ran together. The spores are round or oval, or more or less irregular in shape, and bright orange red (Pl. IV, fig. 2). They varied much in size, 28 – 22 × 22 – 17μ. There were no paraphyses.

The *teleutospore* pustules are much smaller and appear like minute black dots scattered about irregularly. The spores are very dark brown, generally constricted at the septa, apparently with 2–4 pores to each cell, 2–5 celled, but usually 4 celled, with a small and inconspicuous mammilla at the free end, looking more like a slight general thickening of the epispore (Pl. IV, fig. 2). The stalk is long, thin, and inflated at some distance from the attachment to the spore, the inflation containing orange red matter. Normal 4 celled spores measured when just wetted 68 – 66 × 26μ and a 3 celled spore 54 × 24μ.

Of the three species of *Phragmidium* on species of *Potentilla* described by De-Toni[*] only one, namely, *Phr. Fragariastri* has so few cells to each spore, and the one I have just described is, I think, not identical with it. I have therefore named it *Phragmidium nepalense*.

PHRAGMIDIUM OCTOLOCULARE, n. s.

On *Rubus rosaefolius*, Smith.

The general appearance of the teleutosporic stage of this fungus (the only one I know it in) is very like that of *Phr. Barclayi*, Dietel,[†] with somewhat large circular pulverulent hypophyllous pustules.

The teleutospores are dark brown 7–9 celled usually, but mostly 8-celled. The surface is distinctly and coarsely tuberculated, and at the free end there is sometimes a minute colourless papilla, but often none. The stalk is long, swells up somewhat in water, is inflated away from the spore, and this lower part of the stalk swells, more than the upper part adjoining the spore (Pl. IV, fig. 1). The stalk is not unlike that of *Phr. Barclayi*. After lying 24 hours in water the gelatinous sheath shrinks upwards towards the spore, leaving a central axis with orange red swellings at the ends. The spore is constricted at each septum to a slight degree. Each cell of the spore is more flattened from above downwards than in the last mentioned species, the vertical depth of each cell being 10μ against 14μ in *Phr. Barclayi*. The spores (taking those which have 7 – 9 cells) measure when recently wetted 130 – 94 × 23 – 25μ but exceptionally a spore of only two cells may be found, measuring 44 × 24μ. I have not observed the germination of these spores; but some spores collected in autumn and put into water did not germinate, and from this I conclude that they must rest. On the other hand some of these spores showed a cell here and there empty; so apparently under special conditions they may also germinate at once.

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[*] Saccardo, *loc. cit.*

[†] I incorrectly regarded it as *Phr. Rubi*, Pers., in my Descriptive List.

I am inclined to regard this fungus as distinct from *Phr. Barclayi* and *Phr. quinqueloculare*, mihi. If it be identical with either, it is with *Phr. Barclayi*; but the spores of the latter are usually 6-celled with smooth surface (or with very shallow inconspicuous warts) somewhat less in length and greater in diameter. I am also unable to match it with any of the six species described by De-Toni* on species of *Rubus*. I propose naming it *Phragmidium octoloculare*.

XENODOCHUS.

XENODOCHUS CLARKIANUS, n. s.

On *Astilbe rivularis*, Ham.

This fungus was collected by Dr. Clark in the Cheog forest about the beginning of August. On one specimen there were large irregular aecidial patches, especially on the stem, accompanied by hypertrophy, just like that caused by *Phragmidium subcorticium* on *Rosa moschata*. These aecidia were exceedingly brilliantly orange red: they occurred also on leaves. The spores are very bright orange red, in rows, squarish or oblong, densely warted, thickened a little at one end (seen best in empty spores) (Pl. IV, fig. 5). They measure 31 – 26 × 26 – 22μ. There were no paraphyses.

But much more numerous were orange waxy looking beds, which to the naked eye resembled *Coleosporium* beds. These in many places simply covered the under leaf surface. I noticed that in some parts these orange waxy beds were gradually changing, and at others had changed into black beds, naked, and under a field lens looking like *Puccinia* beds. The spores from the latter are scraped off with difficulty, and when examined under the microscope presented characters most like those I have read described as *Xenodochus* spores. They have characters, as far as I am able to judge, intermediate between this genus and *Phragmidium*. The spores were in rows, usually 5 to 6 in each row, pale brown, rows being sometimes transversally septate, at others irregularly in various obliquities. The rows of spores were sometimes closely amalgamated with rows on either side. Each spore of a regular row measured about 16 × 13μ (Pl. IV, fig. 4). I placed these spores in water, but they refused to germinate.

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* Saccardo, *loc. cit.*

This is apparently a new species of *Xenodochus.* It differs considerably from *X. carbonarius*, Schlect. in which the aecidiospores are 28 – 16 × 20 – 15μ and among which there are paraphyses. Moreover, in the last named species the teleutospore rows have 10 to 20 loculi.

MELAMPSORA.

MELAMPSORA CILIATA, n. s.

On *Populus ciliata*, Wall.

This host is abundant in Simla, and many are occasionally attacked by a species of *Melampsora*. The uredo stage makes its appearance in August or September.

The uredo pustules are minute and discrete, but often very abundant; they are light yellow, and entirely hypophyllous, with scattered yellow dots on the upper leaf surface. The spores are pale orange red, mostly oval, pretty densely covered with spines, thick walled, and measure when fresh 30 – 21 × 22 – 20μ (Pl. V, fig. 15). They are borne singly on stalks, and among them are some capitate paraphyses, with heads very distinctly, and often greatly thickened at the free end (Pl. V, fig. 15).

The teleutospore beds are at first orange red, but become brown later. They are entirely hypophyllous. The spores are in compact beds and each spore measures 34 – 30 × 9 – 8μ.

This fungus is, I think, different from any of the three described by De-Toni. This will be apparent when the characters are shown tabularly.

	Uredospores.	Teleutospores.	Paraphyses.	Remarks.
M. Tremulae, Tul.	24 – 15 × 18 – 13	55 – 45 × 12 – 11	Clavate, 9 – 15.	
M. aecidioides, D. C.	24 – 17 × 17 – 15	?	Clavate.	
M. populina, Jacq.	38 – 28 × 20 – 15	45 – 40 × 13	Capitate, 20-17.	epiphyllous.
M. ciliata, mihi ...	30 – 21 × 22 – 20	34 – 30 × 9 – 8	Capitate.	hypophyllous.

MELAMPSORA AECIDIOIDES, D. C. ?

On *Populus alba*, Lin.

Mr. Lace sent me specimens of the leaves of this plant collected at an elevation of 8,500 feet on the 30th August. The under surfaces were almost wholly covered with brilliant orange red pustules, minute and discrete, though from their enormous numbers they at first sight appeared to be coalescing. The upper leaf surface is profusely flecked with yellow discoloured spots. The spores are orange red, thick walled, spiny, and measure when just wetted $24 - 21 \times 18 - 16\mu$. There were no teleutospores.

It is impossible from the uredo spores alone to determine the exact position of this fungus. Possibly it is *M. aecidioides* which occurs also on *Populus alba.* The uredospore measurements coincide very closely with those I have just described, but *M. aecidioides* has paraphyses whilst the Himalayan form has not.

ISOLATED AECIDIA.

Aecidium Cunninghamianum, n. s.

On *Cotoneaster bacillaris,* Wall.

I found the leaves of this plant bearing several characteristic *Roestelia* patches first on the Mahasu hill by the road side; then fairly abundantly in Narkanda; and lastly, scarcely in Mashobra. These were found at the end of August. In all these localities, especially Narkanda and Mashobra, I did not see a single *Cupressus* tree, and this inclines me to regard the fungus as distinct from *Gymnosporangium Cunninghamianum,* mihi. The leaf patches were red above, with long filiform peridia on the lower surface, about 3-5 mm. in length. From one to five such patches were found on a single leaf. On superficial examination this fungus *looks* different from *Gymnosporangium Cunninghamianum,* although the peridium bursts in the same way, namely, by irregular slits on the tube sides. With a field lens numerous spermogonia could be seen on the upper leaf surface.

The aecidiospores are yellowish brown, round or oval, densely beset with minute and very shallow warts, and with apparently numerous germ pores (the addition of sulphuric acid discloses eight pores). These spores measure $28 - 26 \times 28 - 24\mu$ (Pl. IV, fig. 7) The peridial cells are paler in colour than the aecidiospores, elongated, separating readily from one another laterally, very spiny (not ridgy), and measure from $60 - 58 \times 26 - 24\mu$ (Pl. IV, fig. 7). The aecidiospores would not germinate in water.

Had it not been for the absence, as far as I could see, of Cupressus trees in the neighbourhood of these aecidial patches, I should have been disposed on the whole to regard this fungus as *G. Cunninghamianum;* and, indeed, this identity is still quite possible, since it is by no means easy to be certain that no Cypress tree exists in the forests in those regions. In support of the view of identity are the manner of dehiscence of the peridium, and the closely corresponding sizes of the aecidiospores and the peridial cells (the former in the case of *G. Cunninghamianum* being on an average $28{\cdot}6 \times 24{\cdot}6\mu$, and the latter $70 \times 22\mu$). I should note also that the peridial tubes of the aecidium on *Cotoneaster* are somewhat longer than those on *Pyrus* (in the latter they are 1 to 2 mm.)

The only *Aecidium* known on *Cotoneaster* is *Aec. Mespili*, D. C.; but the aecidiospores of this species are $24 - 19\mu$. in diameter, and I do not think the Simla species can be the same. Until more is known of its life history I propose naming it *Aec. Cunninghamianum*, believing that it will probably prove to be identical with *Gymnosporangium Cunninghamianum*, mihi.

AECIDIUM MORI, n. s.

On *Ficus palmata*, Forsk.

I found this plant first attacked in a valley to the north of Mashobra, and subsequently in Simla itself during October. The leaves are often densely covered with an orange red eruption. In some cases the whole of the lower leaf surface was a mass of these bright pustules. But although the eruption is mainly hypophyllous it is also largely epiphyllous. With a field lens it is difficult to determine the nature of the fungus. Each spore heap is very minute, but shreds of white tissue are seen about them. Under the microscope however, all doubt ceases, for there are very characteristic peridial cells, and the fungus is consequently an *Aecidium*. But it is a very remarkable one in having so small and inconspicuous a peridium. To the naked eye the fungus resembles a Uredo form. The spore beds are scattered irregularly all over the leaf surface; but sometimes on somewhat swollen weals on the petiole and midrib. The aecidiospores are very brilliant orange red bodies, round to oval, and apparently smooth on the surface. When just wetted they measure $17 - 14 \times 16 - 14\mu$. The peridial cells are colourless and more delicate than usual. They are mostly six-sided and spiny or tuberculated. They measure $22 \times 18 - 19\mu$. I placed some of the aecidiospores in water on the 17th of October, and a few were found to have germinated on the following day. The germ tube is long, simple, and unbranched.

Saccardo mentions a *Puccinia sepulta*, B. et C. on the leaves of a species of *Ficus* from Nicaragua and two Uredo forms (*U. Fici*, Cast. and *U. ficicola*, Speg.); but even supposing these Uredo forms are really *Aecidia*, the spores of the former are much too large, and those of the latter considerably larger than the Simla fungus to permit of their being considered identical. The Simla species is probably therefore new.

This fungus is identical with that I have described as *Caeoma Mori;* and as I have subsequently found that the peridium is distinctly present though incoherent, I feel disposed to relinquish the name *Caeoma Mori* and to substitute *Aecidium Mori.*

AECIDIUM FLAVESCENS, n. s.

On *Senecio rufinervis*, D. C.

I found this plant in August bearing an *Aecidium* in the Mashobra woods. The aecidial patches are indicated conspicuously by brown patches with yellow irregular halos around them on the upper leaf surface. On the under surface the peridia are indistinctly seen against the white tomented natural leaf surface, as they are pale in colour. The peridia are densely aggregated together, and always on the under leaf surface. The tubes are short and open stellately. I counted from one to thirty-two aecidial patches on single leaves. The patches varied from a half to 2 c.m. in diameter. The aecidiospores are oval or round, pale orange red, measuring when well moistened 22 – 20 × 16 – 14μ. The peridial cells are almost isodiametric, very rugose on the surface, with short ridges and spines, and measuring 28 – 22 × 22 – 20μ. (Pl. IV, fig. 8).

Later in the season leaves in the same locality bore uredospores, and still later teleutospores in the form of *Coleosporium*. I have unfortunately had no opportunity of examining these forms.

Two species of *Aecidia* on species of *Senecio* are noted by Saccardo, *Aec. Hualtatinum*, Speg., and *Aec. sclerothecium*, Speg.; but the spores of the Simla species are much smaller than those of either of these two species.

AECIDIUM AQUILEGIÆ, Pers. ?

On *Aquilegia vulgaris*, Linn.

Mr. Lace collected this plant on the 9th August, 1890 at an elevation of 10,000 feet bearing an *Aecidium*. The peridia are hypophyllous, forming a patch of yellow below with a paled area above on which spermogonia may be seen with a field lens. The peridia open by a clean regular margin. The peridial cells are angular, almost isodiametric, five to six-sided, spiny and ridgy, and about 26 × 20μ. The aecidiospores are round or facetted when just scraped off, tuberculated, and 24 – 18 × 18 – 12μ.

This fungus is very possibly *Aec. Aquilegiae*, Pers. though the spores in the latter are said to be larger (30 – 16 × 20 – 14μ.) and perhaps more spiny.

AECIDIUM ORBICULARE, n. s.

On *Clematis grata*, Wall.
,, *orientalis*, Linn.
,, *puberula*, H. f. and T.

This *Aecidium* was sent to me first by Mr. Lace and Dr. Watt, and subsequently I found it myself at Mattiain on *Clematis grata.*

Aecidial patches were very numerous on stems, petioles, and leaves, causing considerable hypertrophy of stems and petioles, especially on *Clematis grata.* On leaves the peridia were markedly circinate in arrangement, and all were hypophyllous. The peridial tubes were long and cylindrical, and opened at the summit with an almost clean margin, *i. e.*, very minutely serrated. They measured about 0.75 m.m. in length. The spores are bright orange red, densely beset with shallow warts, round to oval or angular, 25 – 20 × 20 – 14 (*Clematis grata*) 21 – 16 × 16 – 15 (*C. orientale*) 22 – 19 × 19 – 15μ. (*C. puberula*).

The peridial cells were in all cases about 26 – 20μ. in diameter, four to six-sided, with bright orange red matter in their centres, and spiny, (Pl. IV, fig. 6).

This may possibly be the New Zealand *Aec. otagense*, Linds.; but the only description available to me is the very brief one by De-Toni, from which it is impossible to decide, since no spore measurements are given. The only other *Aecidium* described by De-Toni on *Clematis* is *Aec. Clematidis*; but the description of the peridium is unlike that I have described. The Himalayan species is therefore, I think, distinct. It is possible that this *Aecidium* is related to *Puccinia Wattiana*, mihi which occurs plentifully on *Clematis Gauriana* and *C. grata*; but in the absence of experimental proof it is impossible to determine.

ISOLATED UREDO FORMS.

UREDO COLEBROOKIAE, n. s.

On *Colebrookia oppositifolia*, Smith.

This fungus was collected by Dr. Watt near Suni in October. The under surfaces of the leaves were almost uniformly orange red in colour from innumerable orange red pustules. These pustules are really distinct, but appear to be coalescing from their great numbers, and from the hairy nature of the leaf surface, in which the spores get entangled. Dr. Watt informed me that showers of red dust fell from the leaves as he picked them. The spores are pale orange red, oval, very spiny, measuring when just wetted 28 – 20 × 20 – 17μ. These spores were put into water some few days after collection, but they did not germinate freely; one or two did so, however, throwing out ong simple sinuous tubes.

UREDO ICHNOCARPI, n. s.

On *Ichnocarpus frutescens*, Br.

This fungus was also collected by Dr. Watt in the same neighbourhood, and at the same time. The leaves bore a few scattered isolated, bright orange red pustules on the under leaf surface. The spores were readily scraped off. They are bright orange red, oval, studded with large coarse warts or spines, and measure when just wetted 24 – 20 × 16 – 21μ. Even in empty spores I could not detect any germ pores. Among the scraped off uredospores I saw some immature single celled stalked spores which I imagine are teleutospores (*Uromyces*); but they were too immature to allow of decision. They were colourless at this early stage.

An *Aecidium Apocyni*, Schwein. is known to occur in Carolina, Kansas, and Illinois; but it is impossible as yet to say whether it is in any way related to the Himalayan fungus: probably it is not.

UREDO IPOMAEAE, n. s.

On *Ipomaea hederacea*, Jacq.

This plant was collected by Dr. Watt near Sairi in September with numerous, white, irregularly shaped covered pustules on the under leaf surface. On examining the pustules they were found to contain an abundance of white powdery spores. The spores are colourless, round or squarish, apparently quite smooth on the surface, and measuring when just wetted 20 – 17 × 16 – 14μ. Although I have placed this fungus here among Uredo forms I should note that it looks much like the *Aecidium* of a *Phragmidium*, differing only in not being coloured.

UREDO PILEAE, n. s.

On *Pilea trinervia*, Wt.

I found a few of these plants in the woods at Mashobra early in October, attacked by a Uredo. The pustules were minute, pale yellow, and scattered on the under leaf surface. The spores are oval, very pale yellow, studded with prominent spines, and measured when just wetted 25 – 20 × 20 – 14μ. I could find no trace of any teleutospore form up to the middle of October.

UREDO EHRETIAE, n. s.

On *Ehretia serrata*, Roxb.

This fungus was collected by Mr. J. S. Gamble on the banks of the Tons river near Chakrata. The leaves are attacked by a Uredinous fungus of somewhat uncertain nature. Some leaves had circular spots varying in diameter from 1 to 8 m.m., whilst others had large hypertrophies of the petiole as it enters the lamina, and these were uniformly covered with bright orange red pulverulent spores. Transverse sections through the fungus and leaf show that the spores are not borne separately on stalks, but from a cup-like depression like the pit of an aecidium without any peridium. There were also numerous superficial spermogonia. The spores are orange red, oval or pear-shaped, very spiny, decidedly thickened at the free end (reminding one of the aecidio- and uredospores of *Puccinia Prainiana*). When just wetted they measure $38 - 30 \times 22 - 20\mu$. They become detached without any portion of the stalk adhering. The spores are given off from both surfaces of the leaves. By applying nitric acid I saw that each spore had two germ pores.

This is the first member of the *Boragineae* which I have seen attacked in India by a Uredine. As *Puccinia Rubigo-vera*, or some variety or allied species, is undoubtedly the most prevalent and destructive rust on wheat, barley, and oats in India, I had long looked for some associated form on a Boragineous host, and this not only by personal search, but also by correspondence. I am afraid, however, that this particular Uredine cannot be the associated form I have been looking for, although it is just possible that it is. For although the spores are given off like uredospores, the cup-shaped depressions in which they are formed, the presence of spermogonia, and the hypertrophy of the host's tissue all render it possible that we have here an anomalous *Aecidium*. This question will have to be tested by experiment.

UREDO AGRIMONIAE, D. C.

On *Agrimonia Eupatorium*, Linn.

This plant is frequently found attacked with a Uredo in these regions; but I have never seen a teleutosporic stage. The Uredo pustules are hypophyllous, very numerous, and minute. The spores are orange yellow, oval, warty or spiny, and measure $22 - 17 \times 14 - 13\mu$, when just wetted.

This is no doubt the widely distributed *Uredo Agrimoniae*.

EXPLANATION OF PLATES.

Plate IV.

1. Teleutospore of *Phr. octoloculare*, × 220.
2. Teleutospore and uredospore of *Phr. nepalense*, former × 220, and latter × 350.

3. Teleuto- and uredospores of *Phr. Laceianum*, × 220 and × 350.
4. Teleutospore of *Xenodochus Clarkianum*, × 350.
5. Aecidiospore of the same × 350.
6. Peridial cells of *Aecidium orbiculare*, × 350.
7. Peridial cells and aecidiospores of *Aec. Cunninghamianum*, *a* × 350, *b* × 220.
8. Peridial cells of *Aec. flavescens*, × 350
9. Teleuto- and uredospores of *Pucc. Ellisii*, × 350.

[*]10. Teleutospore of *Pucc. Wattiana*, × 350.

Plate V.

11. Teleuto- and aecidiospores and promycelium of *Phr. quinqueloculare*, × 350.
12. Teleutospores of Pucc. *excelsa*, × 350.
13. Teleutospores of Pucc. *occulta*, × 350.

[*]14. Teleutospores of Pucc. *McIntirianus*, × 350.

15. Uredospores and paraphyses of *Melampsora ciliata*, × 350.
16. Teleutospores of Pucc. *crassa*, × 350.
17. Teleutospores of Pucc. *caudata*, × 350.
18. Teleutospores of *Pucc. Castagnei*, × 350.
19. Teleuto- and uredospores of *Uromyces Vignae*, × 350.

X.—*Notes on the Collection of Snakes in the Indian Museum with descriptions of several new species.—By* W. L. SCLATER, M. A., *Deputy Superintendent of the Indian Museum.*

[Received 1st August, 1891; read 5th August, 1891.]

(With Plate VI.)

The following notes were drawn up while critically examining and rearranging the collection of Snakes in the Indian Museum; the collection is a fairly large one though there are many Indian species still unrepresented, and I should be very glad if any one would assist me to fill up the gaps especially in the Southern Indian and Ceylonese forms in which the Museum is specially deficient.

The number of Snakes described by Mr. Boulenger in his work on the Reptiles of the Indian Empire and Ceylon amounts in all to 264, of this number the Indian Museum possesses examples of 196, so that no less than 68 are still wanting to complete the Indian Museum Collection; of the 68 deficiencies, however, 22 at least of the species have only been got once and are represented in the British Museum or elsewhere usually by a single specimen.

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[*] For descriptions of these, see J. A. S. B., Vol. LIX, Pt. II, No. 2, 1890.

To the 264 snakes given in Mr. Boulenger's work I have now eleven to add, of which five are new, and described here for the first time and six are exotic species now recorded from the Indian Empire for the first time, so that the total number of Indian Snakes is now raised to 275.

The Indian Museum possesses a fair number of types, but unfortunately several which I believe should be here are no longer to be found in the collection, such is the case with *Typhlops andamanensis*, Stoliczka, *Calamaria catenata*, Blyth, and several others.

The following is a list of the species, twenty-one in number, of which the types are still in the Museum.

Typhlops theobaldianus, Stol.
Trachischium fuscum, (Bly.)
,, *tenuiceps*, (Bly.)
Blythia reticulata, (Bly.)
Lycodon gammiei, (Blanf.)
Hydrophobus davisoni, (Blanf.)
Pseudocyclophis bicolor, (Bly.)
Ablabes scriptus, Theob.
,, *nicobarensis*, Stol.
Zamenis ladaccensis, Anders.
Zaocys nigromarginatus, (Bly.)
Coluber prasinus, Bly.
Pseudoxenodon macrops, (Bly.)
Tropidonotus platyceps, Bly.
,, *nigrocinctus*, Bly.
Dipsas multifasciatus, Bly.
Hypsirhina blanfordi, Boul.*
Distira tuberculata, (Anders.)
Amblycephalus modestus, (Theob.)
,, *macularius*, (Bly.)
Trimeresurus cantoris, Bly.

To these must be added the types of the five new species described below.

Ablabes stoliczkae.
Simotes woodmasoni.
Zaoccys tenasserimensis.
Tropidonotus pealii.
Tropidonotus nicobaricus.

There are also in the Indian Museum the types of the following species found on the borders of the Indian Empire but not yet recorded from within its limits.

Typhlops persicus, Blanf.
Calamaria stalknechti, Stol.
Pseudocyclophis persicus, (Anders.)
Dipsas rhinopoma, Blanf.

The total number of types therefore in the Indian Museum is thirty.

It is only due to Mr. Boulenger to add that it is entirely owing to his useful and excellent manual on Indian Reptiles in the Indian Fauna series that I have been able to work out and rearrange the Snakes in the Indian Museum, so much has been done since Günther's Reptiles of British India appeared and that scattered over so many various separate works and periodicals.

The Snakes in the Museum are now arranged in accordance with

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* Originally described by Blanford as *H. maculosa*, name changed by Boulenger.

Mr. Boulenger's work, and a complete list of them will shortly be published, in the meantime the following notes may be found useful.

TYPHLOPS DIARDI, Schleg., Boulenger, p. 238.
TYPHLOPS BOTHRIORHYNCHUS, Günth., Boulenger, p. 239.

I have found it difficult to separate these two species, in fact the only distinction pointed out by Boulenger is the presence of the pits below the nostrils, these I have found vary considerably in depth and conspicuousness; all the specimens of *T. bothriorhynchus* in the Indian Museum were procured in Assam where *T. diardi* also seems to be most abundant; it would therefore seem possible that this pit might be a sexual or seasonal mark, and that these two species are really one and the same.

TYPHLOPS THEOBALDIANUS, Stol., Boulenger, p. 240.

Of this species, which seems to be unrepresented in the British Museum Collection, the Indian Museum possesses two examples, one the type, the history of which is unknown, and a second procured by Capt. J. Butler at Samagooting in the Naga hills.

TYPHLOPS ACUTUS, (Dum. et Bibr.), Boulenger, p. 241.

This species is not confined to Southern India, it extends to Bengal, and the Indian Museum contains specimens from Sipri in Gwalior, Chybassa in Chota Nagpur, Calcutta and Krishnaghur.

PYTHON MOLURUS, (Linn.), Boulenger, p. 246.

Boulenger does not mention whether the present species extends to China, Günther also expresses a doubt on the subject, the matter may now be settled as the Indian Museum possesses an undoubted specimen of *P. molurus* procured by Surgeon-Major Hungerford at Haiphong (Hiaofung ?) near Shanghai.

SILYBURA NIGRA, Beddome, Boulenger, p. 263.

Silybura wood-masoni, Theobald (Cat. Rept. Brit. Ind., p. 135) the type of which is in the Indian Museum, seem rather referable to *Silybura nigra* than to *S. pulneyensis.*

SILYBURA BREVIS, Günth., Boulenger, p. 268.

This species extends northwards to the Ganjam hills, whence the Museum possesses a specimen presented by Col. R. H. Beddome.

CALAMARIA CATENATA, Blyth, Boulenger, p. 282.

The type of this species is no longer in the Museum, it had apparently disappeared before the collections of the Asiatic Society were transferred to the Indian Museum, as is mentioned by Theobald in his Catalogue of Reptiles in the Asiatic Society's Museum so that unless the species is rediscovered in Assam, nothing further can be known about it beyond what is contained in Blyth's rather meagre description.

CALAMARIA SUMATRANA, Edeling, Natuur. Tijdsch. Ned. Indië xxxi, p. 379, (1870).

A specimen of this apparently rather rare snake from Singapore presented to the Museum by Mr. Davison, was kindly identified for me by Mr. Boulenger; it has hitherto been known from Sumatra only.

TRACHISCHIUM GUENTHERI, Boulenger, p. 285.

There are three snakes in the Indian Museum which seem referable to this species, one from Katmandu in Nepal and two labeled "Allahabad J. Cockburn," the latter probably came from Naini Tal as there are other Himalayan snakes in the collection presented by Mr. Cockburn labelled Allahabad; it is probable therefore that this is the more western representive of *Trachischium fuscum* from which it differs merely in colouration and the number of ventral shields.

TRACHISCHIUM RUBRIVENTER, (Jerdon), Boulenger, p. 286.

The type of this species does not seem to be in the British Museum as the species is "unknown to Mr. Boulenger," neither have I been able to find it among the specimens in the Indian Museum, unless therefore the species is rediscovered, nothing further can be known about it.

LYCODON STRIATUS, (Shaw), Boulenger, p. 292.
LYCODON TRAVANCORICUS, (Bedd.), Boulenger, p. 293.

There are no specimens of *L. striatus* in the Museum from Southern India, the localities from which there are specimens are the hills below Simla, Jemper in Sind, Lahore, Agra, Ajmere, Rajputana, and the Ganjam district; the species is recorded from the Anamalai hills by Günther, but this was before *Lycodon travancoricus* which resembles *Lycodon striatus* very strongly had been discriminated; of this species (*S. travancoricus*), the Museum possesses examples from the Nilgiri hills, the South Arcot district and Tinnevelly hills, it therefore appears probable that it entirely replaces *S. striatus* in the southern part of the Indian Peninsula.

LYCODON FASCIATUS, (Anders.), Boulenger, p. 295.

The Indian Museum possesses two specimens of this rather rare species, one from Shillong in the Khasia hills collected by the late Major Cock, and one from Tezpur obtained by Col. Godwin-Austen; the species has been hitherto recorded only from the Kakhyen hills and Western Yunnan.

POLYODONTOPHIS BISTRIGATUS, (Günth.), Boulenger, p. 304.

The geographical area of this species can be extended to the Nicobars whence there is an example procured by Mr. de Roepstorff.

ABLABES STOLICZKAE, sp. nov. Pl. VI, fig. 1.

Rostral shield broader than deep, the part visible from above about two-thirds the length of the internasals; internasals shorter than the prefrontals and somewhat triangular, frontal hardly as long as its distance from the end of the snout, and a good deal shorter than the parietals; nostrils rounded, about the middle of the length of an undivided shield which is quite three times as large as the loreal; this latter is very small and squarish; one preocular not reaching the upper part of the head, two postocular both in contact with the parietals; eye of moderate size, about half the length of the snout; temporals 1 + 2; upper labials eight, fourth and fifth entering the eye; four lower labials in contact with the anterior chin shields which are about as long as the posterior. Scales smooth, in fifteen rows. Ventrals 153-4, subcaudals 116-9. Anal divided. Colour light olive-brown above, lighter olive yellow below, the two colours separated in front by a conspicuous broad longitudinal black streak, extending from just in front of the eye back along the neck for an inch or so.

There are two specimens of this species in the Museum. One procured at Samagooting in the Naga hills of Assam by Capt. J Butler, the other to which no locality is attached but which was received from Dr. F. Stoliczka of the Geological Survey.

This species differs from all the Indian species of *Ablabes* described by Boulenger, except *Ablabes calamaria*, in having a single nasal shield; in all the other species of the genus the nasal shield is divided or semi-divided.

From *A. calamaria* to which it is most nearly allied, it differs in having a loreal distinct from the nasal shield, in having both postoculars in contact with the parietal and in the much larger number of subcaudals, 116-9 against 64-76 in *A. calamaria*.

ABLABES DORIAE, (Boul.), Boulenger, p. 306.

The Indian Museum is indebted to Mr. R. D. Oldham of the Geological Survey for a specimen of this rather rare snake which he procured in Munipur.

ABLABES COLLARIS, (Ménétries), Blanford, Persia, p. 405.

Two snakes collected by Dr. Anderson in Palestine near Lake Galilee seem referable to this species; they agree very well with the description given by Blanford (*l. c.*) of a Persian specimen in the Genoa Museum except that in the Palestine specimens, the posterior chin shields are slightly smaller than the anterior ones, whereas in the Persian specimen the chin shields are said to be equal in size; the allied species *Ablabes modestus* has been recorded from Palestine, but not so far as I am aware the present one.

SIMOTES CYCLURUS, (Cantor), Boulenger, p. 311.

The type specimens of *Simotes obscurus* and *Simotes crassus* are undoubtedly both faded specimens of this species, as was surmised by Boulenger (*l. c.*); with regard to some of the specimens in the Museum, it is very difficult to say, whether they should be referred to this species or *S. albocinctus*, since the number of anterior temporals and labials entering the eye seem to vary somewhat, so that some of the examples are coloured like one species, but scaled like the other, possibly this may be due to hybridism.

Judging from the specimens of these two snakes in the Indian Museum, it would appear that *S. cyclurus* was an inhabitant of higher lands than *S. albocinctus.*

SIMOTES PURPURASCENS, (Schleg.), Boulenger, P. Z. S. 1890, p. 34.

This species with which according to Boulenger (*l. c.*) *Simotes trinotatus*, Dum. et Bibr., *S. labuanensis*, Günth., *S. catenifer*, Stol. and *S. dennysi*, Blanf., are conspecific, may now be included among the snakes of the Indian Empire, since a specimen was procured by Dr. Anderson from Tavoy in Tenasserim and is now in the Museum.

SIMOTES WOOD-MASONI, sp. nov. (Plate VI, fig. 2.)

Nasal divided; portion of the rostral seen from above a little shorter than its distance from the frontal; suture between the internasals shorter than that between the prefrontals; frontal longer than its distance from the end of the snout, as long as the parietals; loreal small, longer than deep; one preocular, one subocular separating the third labial from the eye margin, two postoculars; temporals 1 + 2; six upper labials, the fourth alone entering the eye, the fifth the largest; four lower labials in contact with the anterior chin shields; posterior chin shields small, less than half the size of the anterior. Scales in 17 rows. Ventrals strongly augulate, 180-6. Anal undivided. Subcaudals 57.

Colour; adult, above brick reddish with traces of a dorsal and three lateral narrow lighter longitudinal lines; below dusky reddish with a light longitudinal line on either side at the angle of the ventrals; head with a dark median longitudinal mark extending back from the anterior end of the frontal to the nape where it bifurcates into the ground colour of the back, an oblique dark streak across the anterior nasal and the three anterior labials; a second oblique streak from the 4th and 5th labials through the eye above which it bifurcates and meets its fellow from the opposite side, a third oblique streak across the parietals and the sides of the neck. In the young the markings are much more conspicuous, the lighter colour being yellow and contrasting strongly with the darker brown of the markings.

This species is most nearly allied to *Simotes violaceus* and *S. octolineatus*; from the former species it differs in the reduced number of its labials, of which only the fourth enters the eye, and also in colouration.

From *S. octolineatus* it differs in having a subocular which excludes the third labial from the eye and in possessing only a single anterior temporal; in colouration, however, especially of the young, the two species much resemble one another.

There are two examples of this species in the Indian Museum, from which this description was drawn up, one from the Andamans collected and presented by Mr. Wood-Mason, and one from the Nicobars where it was procured by the late Mr. F. A. de Roepstorff.

SIMOTES THEOBALDI, Günth., Boulenger, p. 318.

The Indian Museum contains four examples of this rather uncommon species, from Mandalay (Anderson), from Meiktalla (Collett), and from Mergui.

SIMOTES PLANICEPS, Boulenger, p. 316.

An example of this snake was procured by Dr. Anderson during one of his two expeditions to Yunnan and Upper Burma, which had apparently never been named or described; unfortunately the specimen is without locality, though it no doubt comes from Upper Burma; the species has hitherto been known from a single specimen only, procured by Fea at Minhla in Burma.

OLIGODON DORSALIS, (Gray), Boulenger, p. 318.

The range of this species may be extended from the Khasia hills south to the Naga and Chittagong hills whence the Indian Museum possesses examples procured by Capt. J. Butler and Mr. Bruce respectively.

OLIGODON SUBLINEATUS, Dum. & Bibr., Boulenger, p. 320.

Two examples of this species indistinguishable from the typical Ceylon specimens were got by Mr. de Roepstorff in the Nicobars and are now in the Museum.

OLIGODON SUBGRISEUS, Dum. & Bibr., Boulenger, p. 321.

This typically Indian species has spread over the natural boundaries of India as far as Killa Abdulla near the Khojak Pass in British Baluchistan whence the Museum possesses a specimen presented by Mr. J. A. Murray.

OLIGODON MELANOCEPHALUS, (Günth.), Boulenger, p. 317.

Gunther (P. Z. S. 1864, p. 491) and Jan. (Icon. Ophid. livr. xiii, pl. iii, fig. 4, Oct. 1865), seem to have described and figured the same snake independently under the same specific name, the former making a new genus for its reception, the latter including it in the genus *Homolosoma*.

The examination of a specimen brought by Dr. Anderson from Sebastiyeh (Samaria) in Palestine confirms Boulenger in placing the species in the genus *Oligodon*.

RHAGERRHIS PRODUCTA, (Gerv.), Peters Monatsb. Akad. Berlin, 1862, p. 275; Murray, Ann. Mag. N. H. (5) xiv, p. 104.

This rather curious snake was described by Peters (*l. c.*) from Senaar in N. E. Africa, and has since been recorded by Murray from Tanjistan and Bushire in Persia; one of the Tanjistan specimens is now in the Indian Museum and agrees with Peters' description in every respect.

ZAMENIS KORROS, (Schleg.), Boulenger, p. 324.

There is an undoubted example of this species in the Indian Museum said to have been procured by Dr. E. F. Keleart in Ceylon; Anderson quoting from Ferguson's "Reptile Fauna of Ceylon" states that this species is not found in Ceylon; it is possible therefore that the specimen in question may be wrongly labelled though there does not seem to be any particular reason for this being the case.

Zamenis ventrimaculatus, (Gray), Boulenger, p. 325.
Zamenis ladaccensis, Anderson, Boulenger, p. 326.

There are no specimens of *Z. ventrimaculatus* in the Indian Museum from Persia or anywhere outside the Indian Empire. The Museum possesses examples from the following localities. Below Simla, Sabathu, Rajanpur in the Punjab, Jeypore Rjpt., and Karachi. Of *Z. ladaccensis* the Indian Museum possesses specimens from Shiraz (including the type of *Gonyosoma dorsalis*, Anders) Bushire, Karman and Regan in Persia; Askan, Zamran, Hung, and Quetta in Baluchistan; Gilgit and Ladak.

If this really represents the true distribution of the two species their geographical areas are quite separate and the two species may be considered quite distinct.

Zamenis diadema, (Schleg.), Boulenger, p. 328.

The distributional area of this snake may be extended eastwards as far as Allahabad perhaps as far as Purneah, as there is a specimen probably from the latter place in the Indian Museum.

Zaoccys tenasserimensis, sp. nov. (Plate VI, fig. 3.)

Rostral as broad as deep, just visible from above; suture between the internasals two-thirds of that between the pre-frontals, frontal longer than its distance to the end of the snout, shorter than the parietals; three loreals, one larger anterior, and two smaller posterior; one long and narrow preocular reaching the top of the head but not touching the frontal; one subocular below it wedged in between the fourth and fifth labials; two postoculars; a single pair of long temporals on either side, the posterior temporals not larger than the ordinary scales; upper labials 7 to 8 in number, one very large labial alone entering the eye; in the specimen described this is on one side the fourth, on the other the fifth; five lower labials in contact with the anterior chin shields which are equal to the posterior; scales in sixteen rows all smooth, the two median dorsal rows and the two outer rows adjoining the ventrals on either side are more or less broad and quadrangular, whereas the five intermediate rows on either side are narrow and oblique. Ventrals not angulate, 201; Subcaudals 123; anal divided.

Colour, black above to greenish olive on the head, anteriorly traces of a white vertebral line, in the middle part of the body a series of ill defined white transverse bands bordered with black posteriorly, on the hinder part of the body, the bands are gradually transformed into seven longitudinal series of white spots separated by a black network, of the series of spots the outer series on either side are on the ventrals; below yellowish the outer edges of the ventrals dusky, tail with a median dusky streak.

This snake is quite different from the only other Indian species of the genus, *Z. nigromarginatus*; in fact it belongs to the other section of the genus characterized by Günther by the possession of three loreals and named by him *Zapyrus.*

It seems to most resemble *Zaoccys fuscus* from Borneo, but differs from this snake in colouration and also in the number and position of upper labials.

COLUBER HELENA, Daud., Boulenger, p. 331.

The range of this snake extends somewhat beyond the limits imposed by Boulenger; the Indian Museum possesses examples from the Purneah district and Mutlah in Bengal and from Samagooting in Assam.

COLUBER RETICULARIS, Cantor, Boulenger, p. 332.

The range of this species too may be extended from Sikkim and Assam southwards to Arakan and Pegu whence the Museum possesses specimens.

COLUBER TAENIURUS, (Cope), Boulenger, p. 333.

Coluber nuthalli, Theobald (Cat. Rept. As. Soc. Mus., p. 51) the type of which is in the Indian Museum, is obviously a young specimen of *C. taeniurus* and is not identical with *Coluber helena* as suggested by Boulenger.

COLUBER RADIATUS, Schleg., Boulenger, p. 333.

The Indian Museum possesses examples of this snake from Backergunge in Lower Bengal (E. Taylor) and from Hong Kong, from neither of which localities is this species recorded by Boulenger.

COLUBER PRASINUS, Bly., Boulenger, p. 334.
COLUBER OXYCEPHALUS, Boie, Boulenger, p. 335.

There are in the Museum examples of both these snakes from Darjeeling (Gammie) whence they are not recorded by Boulenger.

TROPIDONOTUS CHRYSARGUS, Schleg., Boulenger, p. 345.
TROPIDONOTUS NIGROCINCTUS, Bly., Boulenger, p. 346.

The distinction given by Boulenger in his key between these two species I find to be by no means a constant one; several of the specimens of *Trop. nigrocinctus* in the Museum possess two anterior temporals; the colouration, however, of the two species is very distinct, the three oblique black streaks, below the eye, behind the eye and on the neck at once distinguishing *Tropidonotus nigrocinctus* from its ally.

TROPIDONOTUS HIMALAYANUS, Günth., Boulenger, p. 347.

This species is much more distinct from *T. subminiatus* than would be gathered from a perusal of Boulenger's description; *T. himalayanus* is much darker and very nearly always retains traces of the dorso-lateral series of white and black spots which are always found in the young, whereas in *T. subminiatus* the ground colour above is much lighter, almost blue, and very seldom retains any traces of the spots; in *T. himalayanus* the labials are all light coloured, edged with black and the oblique dark streak, under the eye so conspicuous a feature in *T. subminiatus* is altogether absent; the ventral surface in *T. himalayanus* is very dark, in some specimens almost black, whereas in *T. subminiatus* it is never dusky.

In none of the large number of specimens of *T. subminiatus* which I have examined, is there any trace of the keels on the outer row of scales, in *T. himalayanus*, however, the outer row of scales is as often keeled as not, and sometimes almost as strongly as in *T. chrysargus* and *T. nigrocinctus.*

The Indian Museum possesses examples of *T. subminiatus* from Sikhim, the Garo, Khasia and Naga hills, Munipur, Yunnan, Burma and from throughout Tenasserim; of *T. himalayanus* from Darjeeling (3000 to 4000 feet), the hills of Assam and Moulmein in Burma.

TROPIDONOTUS PLUMBICOLOR, Cantor, Boulenger, p. 351.

As is so often the case with Southern Indian forms, this species extends its range northwards to Mt. Aboo in Rajpootana; the Indian Museum also possesses examples from Nowgong and the Upper Godavery district in the Central Provinces, from the Nilgiri, Anamalai and Tinnevelly hills in S. India and from Galle in Ceylon.

TROPIDONOTUS ANGUSTICEPS, Blyth, J. A. S. B. xxiii, p. 295; Boulenger, p. 352.

Three bottles containing four snakes were found amongst the collection of the Indian Museum labelled *Tropidonotus angusticeps*, of these snakes one was obviously *T. piscator* and does not seem to have been one of Blyth's original specimens; of the others, two with no history attached are without doubt examples of *Tropidonotus hydrus*, and the fourth, which was said to be the actual type of *T. angusticeps* collected by Capt. Abbott in Ramri Island on the Arakan coast is a very faded specimen of *Pseudoxenodon macrops.*

The description of *T. angusticeps* seems to refer to both the latter species, *T. hydrus* and to *Pseudoxenodon macrops.*

TROPIDONOTUS PEALII, sp. nov. (Plate VI, fig. 4.)

Eye moderate, its diameter hardly equal to its distance from the nostril; rostral just visible from above; internasals broadly truncated anteriorly, suture between them shorter than that between the prefrontals; frontal longer than its distance to the end of the snout, shorter than the parietals; loreal nearly square; 1-2 preoculars; 2-3 postoculars; temporals 2 + 2; upper labials nine, fourth and fifth entering the eye; five pairs of lower labials in contact with the anterior chin shields, which are shorter than the posterior. Scales in 19 rows, strongly keeled, outer row also keeled but not so strongly as the rest; ventrals 142-144, subcaudals 75-77, anal entire.

Colour in spirit dark brown above, with a narrow light longitudinal line on either side, edged rather darker reaching the length of the body, below on either side occupying the lateral scales bordering the ventrals another light and much broader band two scales wide; head dark brown above, the upper and lower labials and rostral yellow, edged and blotched with brown, ventrals very dark brown each tipped laterally with light yellow, the longitudinal band so formed enlarges anteriorly to form a large white mark under the posterior lower labials; an indistinct yellow line along the middle of the ventral shields rather more conspicuous posteriorly.

Total length, 20 in.; tail 5 in.

This species is a very well marked one in every way; it differs from all the other Indian species (except *T. plumbicolor*?) in having an undivided anal shield; apart from this it is perhaps somewhat allied to *Tropidonotus parallelus* with which it agrees in having a small eye and the outer row of scales keeled.

There are in the Indian Museum two examples of this snake, both collected in the Sibsagar district of Assam by Mr. S. E. Peal, who has contributed very largely to our collection of snakes and after whom I have much pleasure in naming this fine new species.

TROPIDONOTUS NICOBARENSIS, sp. nov. (Plate VI, fig. 5.)

Eye large, its diameter exceeding its distance from the nostril; nostril just visible from above; internasals truncated, suture between them and between the prefrontals about equal in length; frontal longer than its distance to the end of the snout, very nearly as long as the parietals;

loreal squarish; one large preocular reaching the top of the head, but not touching the vertical; three postoculars; temporals 1 + 2, the posterior pair very much smaller than the anterior and hardly larger than the scales around; upper labials 7 or 8, the third and fourth, or fourth and fifth entering the eye; five pairs of lower labials in contact with the anterior chin shields which are much shorter than the posterior ones. Scales in 19 rows strongly keeled including the outer row; ventrals 162; subcaudals 119; anal divided.

Colour, above bluish olive with a longitudinal dorsal band from the nape to the tail about two scales wide bordered on either side by a narrow black line, another indistinct white line laterally on either side, head uniform, a black streak behind the eye; below lighter than above, uniform; chin, upper labials and snout yellowish without the bluish tinge.

The only example of this new species is one from Camorta in the Nicobars, procured there by Mr. de Roepstorff.

I have referred this snake to *Tropidonotus*, but I am by no means certain that it is properly there located; the only example in the Museum is a small and obviously young one, and I cannot make out that there is very much difference in the size of the maxillary teeth, and the number of subcaudals is very high for this genus; the only species which it seems to resemble at all is *Prymniodon chalceus*, Cope (Günther, Reptiles Brit. Ind. p. 274) which is said to have come from Siam; with the description of this species in Günther, it agrees admirably except in the two important characters of the dentition and the anal shield.

The maxillary teeth of *Prymniodon* are said to be very considerably larger anteriorly than posteriorly, and the anal shield is entire; in the species before me the maxillary teeth appear to be of equal length throughout, and the anal is divided; it is therefore impossible to identify the Nicobar species with *Prymniodon* and I have thought it best, until more specimens are forthcoming to leave it in the genus *Tropidonotus*.

TROPIDONOTUS RHODOMELAS, Boie, Blanford, P. Z. S. 1881, p. 221.

Tropidonotus mortoni, Theobald, (Cat. Rept. As. Soc. Mus. p. 57) is referable to this species of which we have examples from Singapore and Sinkip Island, Sumatra.

TROPIDONOTUS TRIANGULIGERUS, Schleg., Anderson, Journ. Lin. Soc. xxi, p. 345.

This snake was obtained by Dr. Anderson in Mergui and the Museum also contains examples from North Tenasserim, the Malay Peninsula and from Sinkip Island, Sumatra; it is not mentioned by Boulenger, and must be added to the Indian Fauna.

DIPSAS MULTIFASCIATA, Blyth, J. A. S. B. xxix, p. 114.

This species, the type of which was described by Blyth, from Subathu near Simla in the North-West Himalayas, was afterwards identified by Stoliczka (J. A. S. B. xxxix, p. 199) with *D. ceylonensis* a species which is otherwise apparently confined to Southern India and Ceylon.

I cannot agree with Stoliczka with regard to this identification, in the first place the preocular shield which extends nearly to the vertical in the case of *D. ceylonensis*, does not or barely reaches the top of the head in *D. multifasciata*; again in none of the specimens of *D. ceylonensis* which I have been able to examine is there the slightest trace of the narrowing of the preocular shield below, so that the lower corner of the loreal enters the eye, this arrangement is found more or less markedly in all the specimens of *D. multifasciata*; finally the colouration of the two species is very different, though perhaps difficult to describe.

The following shows at a glance the difference between the two species, the characters being taken from an examination of the specimens in the Museum:—

Dipsas multifasciata.	*Dipsas ceylonensis.*
Loreal entering the eye below the preocular except in two cases where the lower corner of the loreal is prolonged in that direction, but does not quite reach it.	No approach of the loreal to the eye, preocular of equal width throughout.
Preocular barely reaching the top of the head in some cases.	Preocular reaching the top of the head and sometimes touching the vertical.
Temporals 1 + 2 or 2 + 1.	Temporals 2 + 3.
Scales in 21 rows.	Scales in 19 rows.
Ventrals 231-248. Subcaudals 96-109.	Ventrals 221-3. Subcaudals 90.
Head with a well marked lateral black band from the prefrontals to the end of the parietals.	All the upper head shields black blotched, no definite longitudinal band.
A median black streak on the nape.	Three ill-defined longitudinal black bands on the nape generally joined by a transverse band behind and forming a trident.
The labials edged with black.	Labials not edged with black.
A well marked streak from the eye to the gape.	Streak from eye to gape ill-defined and interrupted.
Ventrals marked with lateral square blotches throughout.	Ventrals irregularly and very lightly spotted.

Of *Dipsas ceylonensis,* the Indian Museum possesses examples from the Anamalai hills only; of *D. nultifasciata* besides the type from Subathu near Simla examples from Mussooree, Naini Tal and Darjeeling.

DIPSAS CYANEA, (Dum. & Bibr.), Boulenger, p. 361.

This species occurs in Tenasserim; there is an example in the Indian Museum from Tavoy.

DIPSAS CYNODON, Cuv., Günther Reptiles Brit. Ind., p. 368.

This species must be added to the fauna of the Indian Empire; there are in the Indian Museum undoubted examples from the Garo hills (Capt. Williamson), Samagooting (Capt. Butler) and Cachar (Museum Collector) in Assam; and from Thyetmyo (W. T. Blanford) the Burma-Siam hills (Museum Collector), and Mergui (W. Theobald) in Burma; this species is recorded from two of the above localities by Theobald in his Catalogue of the Snakes of the Asiatic Society, and it seems curious that this should have been overlooked by Boulenger.

DRYOPHIS FRONTICINCTUS, Günth., Boulenger, p. 368.

There is a snake in the Indian Museum from Sibsagar in Assam presented by Mr. S. E. Peal which I am unable to identify with any other species; if this is the case it cannot be that this snake is confined to the neighbourhood of brackish water as is suggested by Stoliczka.

DRYOPHIS MYCTERIZANS, (Daud.), Boulenger, p. 370.

This snake like many other Southern Indian species extends northwestwards as far as Mt. Aboo in Rajputana.

DRYOPHIS PULVERULENTUS, (Dum. & Bibr.), Boulenger, p. 371.

This species is apparently generally distributed throughout Peninsular India, there are six undoubted examples in the Indian Museum collected by Mr. V. Ball in Maunbhoom.

CERBERUS RHYNCHOPS, (Schneid.), Boulenger, p. 374.

This species appears to be common on the Andamans and Nicobars.

HYPSIRHINA BLANFORDII, Boulenger, p. 377.

This species is founded on a single specimen described by Blanford as probably from the neighbourhood of Bassein; this unique specimen does not seem to be in the British Museum as Mr. Boulenger distinctly says that he has not been able to examine it; there is, however, an example of this species in the Museum with no recorded history, which had been identified by Dr. Anderson as *Gerarda bicolor*, and it is possible that this is the missing type which has lost its label.

HYPSIRHINA SIEBOLDII, (Schleg.), Boulenger, p. 377.

This species occurs in Assam; the Indian Museum contains a specimen from Samagooting in the Naga hills.

FORDONIA LEUCOBALIA, (Schleg.), Boulenger, p. 378.

This species occurs in the Sunderbunds, there is an example thence in the Museum, presented by the Rev. H. J. Harrison.

CALLOPHIS NIGRESCENS, Günth., Boulenger, p. 384.

This species varies considerably in colour, of the specimens in the Indian Museum, there is one referable to the spotted variety (var. A. of Boulenger) from the Wynaad; three of the variety with three longitudinal white-edged bands (var. B. of Boulenger) from Malabar, the Anamalai and the Shevaroy hills; and finally two of the variety with five longitudinal bands from Malabar and Ganjam.

MEGAEROPHIS FLAVICEPS, Reinh., Günther Rept. Brit. Ind. p. 346.

This species, which is not mentioned by Boulenger, should be included among the Snakes of the Indian Empire; there is an example of it in the Museum from Mergui in Tenasserim, presented by Mr. W. Theobald.

BUNGARUS CAERULEUS, (Schneid.), Boulenger, p. 388.

This snake, which is found all over India proper, appears to be very rare on the eastern side of the Bay of Bengal, in fact the Indian Museum possesses what I believe to be the only specimen recorded thence, one procured by Col. Nuthall from Rangoon, and this might have easily reached Burma by ship. Lately, however, the Museum has received a pair of "Kraits" from Meiktalla in Upper Burma where they were found by General H. Collett which differ in some respects from the ordinary Indian form of this snake, although hardly perhaps enough to merit specific distinction.

The following are the points in which this variety differs from the typical Indian form.

The rostral is deeper than broad and extends back to about two-thirds or three-fourths of its distance from the frontal; the ventral shields number 223 and 228 respectively and the subcaudals 49.

The colour above is a dark slaty blue, the dorsal scales are alternately yellow and slate coloured, the yellow extending for about 10 or 12 scales and reappearing again after a somewhat longer interval; the scales on the sides of the yellow dorsal scales also exhibit conspicuous pale edgings so that the whole snake has the appearance of about 12 light coloured bands encircling the body.

BUNGARUS BUNGAROIDES, (Cantor), Boulenger, p. 389.

An example of this snake from Darjeeling presented by Mr. J. Gammie has a well marked loreal shield present on either side of the head.

BUNGARUS LIVIDUS, Cantor, Boulenger, p. 389.

The range of this species extends as far as Lower Bengal as is shown by an example procured at Saidpur in the Dinajpur district presented by Mr. W. de W. Peal.

The vertical scales of this snake are said by Mr. Boulenger to be "but feebly enlarged and not broader than long," in two, however, out of the three examples of this species in the Museum, the vertebral scales are certainly broader than long in the posterior part of the body.

NAIA TRIPUDIANS, Merr., Boulenger, p. 391.

There are in the Indian Museum a very large number of Cobras from different parts of India, and it seemed worth while to try and make out how far the various colour varieties of the Cobra were constant to fixed geographical areas.

The specimens in the Museum are all spirit-preserved ones and not very large, and although a great deal more has still to be done before an accurate knowledge of the geographical distribution of the varieties can be made out, the following seems to roughly indicate the truth.

a. Hood with the well known spectacle-marking on it; above and below, stone coloured, with the characteristic dark pectoral band across the chest.

In the Indian Museum examples from Banda, N.-W. P., Ganjam district, Calcutta, and the Krishnagar district.

This is "var. *a*" of Günther's Reptiles and the "Gokurrah" of Fayrer, and is probably found throughout the peninsula of India.

b. Hood with a white circular marking, edged with black, behind the hood-marking is a dark, followed by a light ring encircling the body, rest of the body dark, mottled lighter.

In the Indian Museum examples from Calcutta only where it appears to be the commonest variety, this is the "Keautiah" of Fayrer and "var. θ" of Günther who also records it from Assam and Sikhim.

c. Hood as above with the circular marking; uniform brown above, below, anteriorly light coloured, posteriorly darker.

In the Indian Museum examples from Assansole, Bengal, Calcutta, Sibsagar and Samagooting, Assam, Chittagong and the Andamans.

This is the variety most commonly met with, I believe, throughout Burma, it appears to correspond to "var. ζ" of Günther which he records from Siam.

d. Hood with no marking, light coloured above and below with darker pectoral bands.

The Indian Museum contains examples of this species from the Rungpur district in Bengal, from Assam, the Chittagong hills, Mandalay and Mergui.

e. Hood with no marking, blue black above and below except slight traces of lighter colour on each side of the throat.

The Indian Museum contains examples of this well-marked variety from the Andamans (?) and Singapore, where it appears to be very abundant.

It seems to correspond to part of "var. ε" of Günther.

f. No marking on the hood; very dark brown, almost black above and below.

The Indian Museum contains examples of this variety from the Punjab and Rajputana, and this is probably the same as part of Günther's "var. ε" which came from the Deccan.

g. No marking on the head, colour a light sandy with bluish tinge; two dark bands on the neck extending all round, behind these two anterior bands a series of chevron-shaped forwardly directed bands, which become fainter towards the tail.

There are examples of this curiously coloured variety in the Indian Museum from Khojak in British Baluchistan and from the Punjab.

This variety was first described by Eichwald as *Tomyris oxiana* and has been shown by Boulenger and Boettger to be conspecific with the typical *N. tripudians.*

DISTIRA CYANOCINCTA, (Daud.), Boulenger, p. 410.

The types of *Hydrophis trachyceps*, Theobald, (Cat. Rept. As. Soc. Mus. p. 70) and *Hydrophis crassicollis*, (Anderson, J. A. S. B. xl, p. 19) may both be referred to this species, the former was got at Mergui, the latter in the Hooghly below Calcutta.

AMBLYCEPHALUS MONTICOLA, (Cantor), Boulenger, p. 415.

There is a snake in the Indian Museum from Camorta in the Nicobars presented by Mr. F. A. de Roepstorff which seems quite identical with undoubted examples of *A. monticola* from Assam.

AMBLYCEPHALUS MACULARIUS, (Blyth ?), Boulenger, p. 416.
AMBLYCEPHALUS CARINATUS, (Reinw.), Günther, Reptiles Brit. Ind., p. 326.

A good deal of confusion in the synonymy of these snakes has been caused by Mr. Theobald, who when examining and cataloguing the Asiatic Society's collection of Snakes identified as the adult and young of the same species certain snakes which had been referred by Blyth to two different species, *i. e.*, *Aplopeltura boa*, Schleg. (Theobald's adult) and *Pareas macularius*, Blyth (Theobald's young).

I have been quite unable to find any published description by Blyth of the latter species and so I must conclude that *Pareas macularius* is a manuscript name.

These snakes which were five in number Theobald first of all (J. Linn. Soc. x, p. 54), referred to *Pareas macularius*, the manuscript name given by Blyth to the three smaller specimens only; afterward (Cat. Rept. Mus. As. Soc., p. 63) he gave a new name, *Pareas berdmorei*, to these same five snakes, and finally (Cat. Rept. Brit. Ind., p. 203) he identified them with *Pareas margaritophorus*, Jan.

On examining the five snakes in question, it was at once evident that the two larger examples were quite distinct from the three smaller ones in colour and disposition of the head-shields and in fact in every way.

The larger snakes have internasals nearly as large as the prefrontals which latter shields are excluded from the eye, and in every other respect resemble *A. carinatus*; while the smaller snakes in which the prefrontal enters the eye, agree with the description of *A. macularius* as given in Boulenger's Reptiles.

Pareas berdmorei is therefore only in part a synonym of *Amblycephalus macularius* as described by Boulenger, and also in part a synonym of *Amblyceplalus carinatus*.

There are in the Indian Museum only the three original specimens of *A. macularius*, which were procured by Major Berdmore at Martaban in Burma; of the other species, *A. carinatus*, which is an addition to the Fauna of the Indian Empire, besides the two specimens procured by Major Berdmore in Tenasserim, there are two from Tavoy (Museum Collector), one from the Burma-Siam hills and one from Mergui (Anderson).

TRIMERESURUS GRAMINEUS, (Shaw), Boulenger, p. 429.
TRIMERESURUS PURPUREOMACULATUS, (Gray), Boulenger, p. 429.

Of these two species there is a very large series in the Museum; and if the insular and Malayan forms be excluded, the two species are fairly constant in scaling and colour. The points of distinction between the two species are as follows:

In *T. purpureomaculatus* the head scales are juxtaposed and convex or keeled, the temporal scales are strongly keeled, the scales are in 25-27 rows and the colour is in spirit a porphyraceous blue; in *T. gramineus* the head scales are small, smooth, and imbricate, the temporal scales are also smooth, the scales are in 19 to 23 rows and the colour is a uniform green.

It is in most cases perfectly easy to distinguish these two snakes, but there are in the Indian Museum some specimens which are intermediate in character, whether they are hybrids or not it is difficult to say, but as the two snakes inhabit approximately the same geographical area, it is quite possible that this may be the case.

Among the intermediate forms may be mentioned nine snakes from Sibsagar in Assam (register no. 4015-23) which have the juxtaposed convex head shields of *T. purpureomaculatus*, but the smooth temporals and 21 rows of scales of *T. gramineus*; again a snake (register no. 4109) from Moulmein has the convex head shields and keeled temporals but only twenty-one rows of scales.

Of *T. purpureomaculatus* the Museum contains examples from Lower Bengal, and from various localities in Assam and Burma; and of *T. gramineus*, examples from Simla, Sikhim, Assam, Burma and Hongkong.

In the Islands of the Bay of Bengal, Preparis Isle, Cocos Isles, the Andamans and Nicobars there are several different coloured varieties of Pit vipers which, in my my opinion with one exception only, are better referred to *Tr. gramineus* than to *Tr. purpureomaculatus*; besides these varieties there is a closely allied form, which is recognised by Boulenger as a separate and distinct species; this is *Tr. cantoris* of Blyth, of which the Museum possesses a fair series, all from the Nicobars with one exception, which is from the Andamans.

The following is a list with brief descriptions of the various varieties above mentioned.

a. Preparis Island variety.

Light brown above with darker dorsal and lateral spots; ventrals light coloured, marbled with brown, scales in 25 rows; this form has the characteristic juxtaposed convex head scales and keeled temporals, and I have considered it to be an insular variety of *T. purpureomaculatus.*

b. Mottled variety.

Brown above blotched with blue, below bluish with brown blotches, scales in 23-25 rows, head scales as in *T. gramineus.* In the Indian Museum there are a good number of snakes of this variety from the Andaman Islands alone.

c. Brown variety.

This resembles the last, but there is little or no trace of the blue mottling on the ventrals which are almost uniform brown. Two examples from the Andamans in the Indian Museum.

d. Uniform or banded variety.

Colour uniform light reddish or dusky or with regular white transverse bands; scales in 21 rows.

This is the variety described by Stoliczka under the name of *T. mutabilis*, and is found on both the Andamans and Nicobars.

e. Green above, lighter below, resembling the typical variety found in Assam and Burma, scales in 21-25 rows.

This variety occurs on the Andamans, Cocos and Nicobars.

All the above varieties with the exception of the first seem to be referable to *T. gramineus* rather than to *T. purpureomaculatus*.

EXPLANATION OF PLATE VI.

Fig. 1. *Ablabes stoliczkae*, sp. nov. × 2.
2. *Simotes woodmasoni*, sp. nov.
3. *Zaoccys tenasserimensis*, sp. nov.
4. *Tropidonotus pealii*, sp. nov.
5. *Tropidonotus nicobaricus*, sp. nov. × 2.

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Order **DIPTERA**.

Suborder HOMALOCERATI.

J. Bigot, *adhuc ined.*

Division NEMATOCERATÆ.

J. Bigot, *adhuc ined.*: Nematocera, Meigen, *Syst. Beschr.*, i, 1818.

Family CULICIDÆ.

J. Bigot, *adhuc ined.*: Culiciformes, Meigen *Syst. Beschr.* i, 1818: Culicidæ, Latr. *Fam. Natur.* 1825: Macquart, *S. à Buff. Dipt.* i, 1834: Culicinæ, Zetterst., *Ins. Laponica*: Culicinæ Rondani, *Prodr.* i, 1856: Culicina, Schiner, *Faun. Austr. Fliegen* 1864.

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* This Catalogue was drawn up by M. Bigot at the suggestion of the late Mr. Atkinson and was to have formed part of the series of Catalogues of the Insecta of the Oriental Region, which have been discontinued since Mr. Atkinson's death.

Genus ANOPHELES.

Meigen, *Syst. Beschr.* i, 1818, p. 10 : Culex, pt., Linn.

annularis, V. der Wulp, *Notes Leyden Mus.*, vi, 1884, p. 249.
Hab. Java.

barbirostris, id. ibid., p. 248.
Hab. Java.

sinensis, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm.* 1828, i, p. 47.
Hab. China.

Genus MEGARHINUS.

Rob.-Desvoidy, (*alias Megarhina*) *Essai sur les Tipul.* : Culex, pt.

splendens, (*Culex*) Wiedem., *Zool. Magaz.* iii, p. 2.
Hab. Java.

Genus CULEX.

Linn., *Faun. Suec.* 1761 : Meigen, *Illig. Magaz.* ii, p. 260, (auct).

laniger, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm*, 1828, p. 5.
Hab. Java.

fuscanus, id. ibid., p. 6.
Hab. India.

fatigans, id. ibid., p. 10.
Hab. India.

molestus, id. ibid., p. 542.
Hab. Sumatra.

sitiens, id. ibid., p. 543.
Hab. Sumatra.

vagans, id. ibid., p. 545.
Hab. China.

amboinensis, (*Melius* Megarhina) Doleschall *Natuur. Tijdschr. Nederl. Indië.* xiv, 1857, p. 381.
Hab. Amboina.

aureostriatus, id. ibid., p. 385.
Hab. Amboina.

cingulatus, id. *Natuur. Tijdschr. Nederl. Indië, Batavia.* x, 1856, p. 405.
Hab. Java.

subulifer, id. ibid., xiv, 1857, p. 382.
Hab. Amboina.

nero, id. ibid., xiv, 1857, p. 383.
Hab. Java.

setulosus, id. ibid., xiv, 1857, p. 384.
Hab. Java.

luridus, id. ibid., xiv, 1857, p. 384.
Hab. Java.

variegatus, id. ibid., xvii, 1858, p. 77.
Hab. Amboina.

annulipes, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 6.
Hab. Singapore.

imprimens, id. ibid., v, 1861, p. 144.
Hab. Amboina.

ventralis, id. ibid., v, 1861, p. 144.
Hab. Amboina.

dives, Schiner *Novara Reise* 1868, p. 31.
Hab. Batavia.

longipalpis, V. der Wulp, *Tijdschr. Ent.* xxii, blz. lxxvii, p. 9.
Hab. Sumatra.

crassipes, id. ibid., p. 9.
Hab. Sumatra.

Family CHIRONOMYDI.

J. Bigot, *adhuc ined.*: Chironomydæ, Schiner *Faun. Austr. Flieg.*, ii, 1864, p. 574: Chironomides Westw., *Introd. Entom.* 1840: Tipul. Culiciform Macquart. *S. à Buff. Dipt.* i, 1834: Chironomides, Macquart, *Dipt. Exot.*, 1838, p. 36.

Genus CERATOPOGON.

Meigen, *Illig. Magaz.* ii, 1803, p. 261: Culex pt. Linn.: Chironomus pt. Fabr, Fallen: Culicides, Latr.; Palpomyda, Prionomyda, Ceratopogon pt., Rossi.

trichopus, Thomson, *Eugenie Resa*, 1868, p. 444.
Hab. China.

agas, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 462.
Hab. Borneo.

Genus CHIRONOMUS.

Meigen, *Illig. Magaz.* ii, 1803, p. 260; Thalassomyia, *pt.* Schiner: Tipula, *pt.* Linn.

venustus, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm.* 1828, i, p. 547.
Hab. China.

vicarius, Walker, *Ins. Saunders. Dipt. London*, 1856, p. 423.
Hab. India.

cubiculorum, Doleschall, *Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 405.
Hab. Java.

pictus, id. ibid., xiv, 1857, p. 386.
Hab. Java.

socius, Walker, *List Dipt. Ins. Brit. Museum London*, 1848, *pt.* 1, p. 16.
Hab. India.

Genus TANYPUS.

Meigen, *Illig. Magaz*, ii, 1803, p. 261 : Tipula *pt.* Linn., Degeer : Chironcmus *pt.* Fabr.

pardalis, Doleschall, *Naturk. Tijdschr. Nederl. Indie, Batavia*, v, 1856, p. 405.
Hab. Java.

melanurus, id. ibid., p. 405.
Hab. Java.

cyanomaculatus, id. ibid , p. 406.
Hab. Java.

nigrocinctus, id. ibid., p. 406.
Hab. Java.

ornatus, id. ibid., xiv, 1857, p. 385.
Hab. Java.

crux, Wiedem. *Anal. Entom.* 10, id., *Ausser Europ. Zweifl. Ins.* i, *Hamm*, 1828, p. 10.
Hab. India.

Genus MACROPEZA.

Meigen, *Syst., Beschr.*, i, 1818, p. 87 : Wiedem., Macq., Walker, Schiner, Rondani, (et auct.).

gibbosa, Wiedem., *Ausser Europ. Zweifl. Ins. pt.* i, *Hamm.* 1828, p. 20.
Hab. India.

Family CECIDOMYDI.

Bigot, *adhuc ined.* 1891 : Tipulariae Gallicoloe, Gallmücken, Meigen, *Syst. Beschr.* 1818, i, p. xxxiv : Cecidomyida, Westw. *Introd. Entom.* 1840 : Cecidomydae, Schiner, *Faun. Austr. Fliegen*, ii, Wien, 1864, p. xviii.

Genus CECIDOMYIA.

Meigen, *Illig. Magaz.* ii, 1803, p. 261, Latr., Wiedem., Macq., Schiner, Rondani, V. de Wulp, Walker, (et auct.) : Tipula, *pt.* Degeer : Dasyneura *pt* Rondani : Oligotrophus, *pt.* Latr.

deferenda, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 105.
Hab. Sarawak.

oryzae, Wood-Mason, *Indian Museum Notes*, i, p. 103, pl. vi, fig. 6.
Hab. Bengal.

Genus LASIOPTERA.

Meigen, *Syst. Beschr.* i, p. 88, 1818: Cecidomyia pt. Meigen: Tipula pt. Linn., Degeer.

bryonicæ, Schiner, *Novara Reise* 1868, p. 5.
Hab. Madras.

Family DIXADI.

Bigot, *adhuc ined.* 1891.

Genus DIXA.

Meigen, *Syst. Beschr.* i, 1818, p. 216.

guttipennis, Thomson, *Eugenie Resa* 1868 p. 448.
Hab. China.

Family TIPULIDI.

Tipulidæ, Leach, *in Sam. Comp.* 1819: Tipulidæ, Schiner, *Faun. Austr. Fliegen* ii, 1864, p. 495: Tipulariæ, Latr. *Hist. Nat. Ins.* 1802: Tipularides, Leach *Edinb. Encycl.* 1815: Tipulides, Westw. *Introd. Mod. Class. Insects*, 1840.

Genus CTENOPHORA.

Meigen, *Illig. Magaz.* ii, 1803, p. 263: Wiedem., Macq., Schiner, Zetterst., Rondani, Ost.-Sacken pt.: Pselliophora, pt. Ost.-Sacken. *Berlin Ent. Zeitschr.* 1886, xxxi. p. 168: Tanyptera, Latr.: Dictenidia et Xyphura, pt. Brullé.: Ceroctena et Xyphura pt. Rondani.

melanura, Walker, *List Dipt. Ins. Brit. Museum London*, i, 1848, p. 78.
Hab. Nepal.

xanthomelana, id. ibid., p. 77.
Hab. India.

melanura, id. ibid., p. 78.
Hab. Nepal.

Genus PSELLIOPHORA.

Ost-Sacken, *Berlin Entom. Zeitschr* 1886, xxx, p. 168: Ctenophora *pt.* Meigen

lœta (*Ctenophora*) Wiedem., *Ausser. Europ. Zweifl. Ins.* i, p. 40: (Tipula id. Fabr.)
Hab. India.

ardens, (*Ctenophora*), id. ibid., p. 39.
Hab. Java.

compedita, (*Ctenophora*) id. ibid., p. 39.
Hab. Java.

taprobanes, (*Ctenophora*) Walker *List. Dipt. Ins. Brit. Mus. London*, 1848, i, p. 77.
Hab. Ceylon.

fumiplena, (*Ctenophora*) Walker *Ins. Saunders. Dipt.* i, *London*, 1856, p. 449.
Hab. China.

javanica, (*Ctenophora*) Doleschall, *Natuurk. Tijdsch. Nederl. Indie, Batavia*, x, 1856, p. 406.
Hab. Borneo, Java.

chrysophila, (*Ctenophora*) Walker *Journ. Proceed. Linn. Soc. Lond.* i, 1857, p. 6.
Hab. Singapore.

curvipes, (*Ctenophora*) V. der Wulp, *Notes Leyden Mus.* vi, 1884, p. 254.
Hab. Gorontalo, Java?

annulosa, (*Ctenophora*) id. ibid., vii, p. 1.
Hab. Java.

rubra, Ost.-Sacken, *Berlin. Entom. Zeitschr.* xxx, 1886, p. 171.
Hab. Laos.

Genus PRIONOTA.

V. de Wulp, *Notes Leyd. Mus.* vii, 1885 p. 1.

nigriceps, V. der Wulp, id. ibid., p. 2.
Hab. Java.

Genus OLIGOMERA.

Doleschall, *Natuurk. Tijdschr. Nederl. Indie, Batavia* xiv, 1857, p. 387, Eriocera, pt. Maquart.

javensis, Doleschall, ibid, p. 387: Eriocera acrostacta, V. der Wulp.
Hab. Java.

Genus PACHYRHINA.

Macquart, *S. à. Buff. Dipt.* i, 1834, p. 88: Tipula pt.: Nephrotoma, pt. Olivier, *Encycl. Method.*

bombayensis, Macquart *Dipt. Exot. Paris*, 1855, *5th Suppl.* p. 15.
Hab. Bombay.

delecta, Walker, *Ins. Saunders. Dipt. Lond.* 1856, p. 445, Tipula id. Macq.
Hab. India.

quadrivittata, V. der Wulp, *Notes Leyden Mus.* vi, 1885, p. 9.
Hab. Java.

triplasia, id. ibid., p. 10.
Hab. Java.

fasciata, Macquart, *S. à Buff. Dipt.*, i, *Paris*, 1834, p. 90.
Hab. Java.

doleschalli, (*Nomen Novum*), Tipula javensis, *Doleschall Natuur. Tijdschr. Nederl. Indie, Batavia.* x, 1856, p. 406: Ost.-Sacken, *Ann. Mus. Civ. Genova,* xvi, 1881. p. 399: P. fasciata ? Macq. (Vid. Suppl.).
Hab. Java.

Genus TIPULA.

Linn., *Faun. Suec.* 1761, p. 430 (et auct).

praepotens, Wiedem., *Auss. Europ. Zweifl. Ins.* i, *Hamm*, 1828, p. 40.
Hab. Java.

monochroa, id. ibid., p. 41.
Hab. Java.

pedata, Wiedem., *Dipt. Exot.* i, p. 23.
Hab. Java.

umbrina, Wiedem., *Auss. Europ. Zweifl. Ins.* i, *Hamm*, 1828, p. 49: T. congrua, Walker.
Hab. Java.

javana, id. *Dipt. Exot.* i, 1821, p. 27.
Hab. Java.

castanea, Macq. *Dipt. Exot.* i, 1838, p. 54.
Hab. Java.

venusta, Walker, *List Dipt. Ins. British Museum*, i, 1848, p. 64.
Hab. Sylhet.

fulvipennis, id. ibid., p. 67.
Hab. Nepal.

reposita, id. ibid., p. 67.
Hab. Nepal.

melanomera, id. ibid., p. 68.
Hab. Nepal.

nova, id. ibid., p. 71.
Hab. Hong-Kong.

vicaria, id. *Ins. Saunders. Dipt. Lond.* 1856, pt. i. p. 445.
Hab. India.

javensis, Doleschall, *Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 406.
Hab. Java.

longicornis, id. ibid. xvii, 1858, p. 79.
Hab. Amboina.

vilis, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 108.
Hab. Borneo.

fumifinis, id. ibid., v, 1861, p. 145.
Hab. Amboina.

serrata, V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 5.
Hab. Serahan?

pilosula, id. ibid., p. 5.
Hab. Java.

leucopyga, id. ibid., p. 6.
Hab. Java.

brobdignagia, Westwood, *Trans. Ent. Soc. Lond.* 1876, p. 504.
Hab. N. China.

Genus CONOSIA.

V. der Wulp, *Tijdschr. Entom.* 1880, p. 159 : Limnobia, pt. Wiedem.

irrorata, V. der Wulp, *loc. cit.* p. 161 : *Limnobia* id. Wiedem. *Ausser Europ. Zweifl. Ins.* i, *Hamm*, 1828, p. 574.
Hab. Java.

crux, id. ibid., p. 161 : (*Limnophila*) Doleschall, *Natuur. Tijdschr. Nederl. Indie, Batavia*, xiv, 1858, p. 388.
Hab. Java.

Genus LIMNOPHILA.

Macquart, *S. à Buff. Dipt.* i, 1834, 95 : Limnobia *pt.* Meigen (et auctor).
Limnomyia, Rondani *Prodr.* 1861, vi, p. 11.

basilaris, Macquart, *Dipt. Exot.* i, *Paris*, 1838, p. 66 : Limnobia id. Wiedem. *Auss. Europ. Zweifl. Ins.* i, *Hamm.* 1828, p. 27.
Hab. Java.

bicolor, id. ibid., p. 66 : Eriocera id. Ost.-Sacken.
Hab Bengal.

Genus ERIOCERA.

Macquart, *Dipt. Exot.* pt. v, *Paris.* 1838, p. 74, Pterocosmus *pt.* Walker : Allarithmia, Loew, *Bernst. Faun.* 1850, p. 38 : Physecrania? *pt.* Bigot, *Ann. Soc. Ent. France*, (3) vii, 1859, p. 123 : Arrhenica, *pt.* Ost.-Sacken, *Proceed. Acad. N. Sci. Philadelphia* 1859, p. 243.

selene, Ost.-Sacken *Ann. Mus. Civ. Genova*, xvi, 1881, p. 406.
Hab. Sumatra.

humberti, Ost.-Sacken, *Berlin. Ent. Zeitschr*, xxxi, 1887, p. 221.
Hab. Ceylon.

meleagris, id. ibid., p. 222.
Hab. Ceylon.

pachyrrhina, id. ibid., p. 222.
Hab. Ceylon.

crystalloptera, id. ibid., p. 222.
Hab. Ceylon.

albonotata, id. ibid., p. 223 : Limnobia, id. Loew, *Peter's Reise*, p. 1.
Hab. Ceylon.

acrostacta, V. der Wulp, *Notes Leyden Mus.* vi, 1884 p. 11 : Limnobia, id. Wiedem. *Dipt. Exot.* p. 1 : Cylindrotoma, id. Macquart, *Dipt. Exot.*, i, p. 168, *Suppl.* iii, p. 7 : Oligoneura javensis, Doleschall.
Hab. Java.

albipunctata, V. der Wulp, *Tijdschr. Entom.* xxiii, p. 158.
Hab. Java.

ferruginosa, id. *Notes Leyden Mus.* vii, 1885, p. 13.
Hab. Java.

lunata, Westwood, *Trans. Ent. Soc. London*, 1881, pt. iii, p. 367.
Hab. Sarawak.

Genus PTEROCOSMUS.

Walker, *List Dipt. Ins. Brit. Mus.* pt. 1, *Lond.* 1848, p. 78 : Eriocera, pt. V der Wulp.

velutinus, Walker, *loc. cit.* p. 79.
Hab. Nepal.

hilpa, id. ibid., p. 79 : Eriocera id., V. der Wulp, *Notes Leyden Mus.* vii, 1885 p. 12.
Hab. Hong-kong.

lunigerus, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 107.
Hab. Borneo.

infixus, id. ibid., p. 107.
Hab. Borneo.

optabilis, id. ibid., p. 107.
Hab. Borneo.

combinatus, id. ibid., p. 107.
Hab. Borneo.

dilutus, id. ibid., p. 108.
Hab. Borneo.

Genus Limnobia.

Meigen, *Syst. Besch.* 1818, p. 116: Tipula, pt. Linn., Fabr.: Limonia, Meigen, *Illig. Magaz.*, 1803: Dicranomyia, pt. et Limnobia, pt. Ost.-Sacken: Limnomyza, Rondani, *Prodr.* i, 1856: Glochina, pt. Meigen, Staeger.

diana, Macq., *S. à Buff. Dipt. Paris*, 1834, p. 107.
Hab. Bengal.

sorbillans, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm*, 1828, p. 551.
Hab. Sumatra.

trentepohlii, id. ibid, p. 551.
Hab. Sumatra.

apicalis, id. ibid., p. 551.
Hab. Sumatra.

bibula, id. ibid., p. 552.
Hab. China.

mesopyrrha, id. ibid., p. 26.
Hab. Java.

costalis, id. ibid., p. 37.
Hab. India.

sumatrensis, Macquart, *Dipt. Exot. Paris, Suppl.*, iv, 1850, p. 16.
Hab. Sumatra.

aterrima, Walker, *Ins. Saunders, Dipt. London*, 1856, p. 434.
Hab. India.

substituta, id., *List Dipt. Ins. Brit. Mus. London*, i, 1848, p. 39.
Hab. China.

sanguinea, Doleschall, *Natuur. Tijdschr. Nederl. Indie*, xiv, *Batavia*, 1857, p. 391.
Hab. Java.

impressa, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 106.
Hab. Borneo.

rubescens, id. ibid., p. 106.
Hab. Borneo.

pyrrhochroma, id. ibid., p. 106.
Hab Borneo.

argentocincta, id. ibid., p. 107.
Hab. Borneo.

leucotelus, id. ibid., p. 6.
Hab. Singapore.

plecioides, id. ibid., p. 6.
Hab. Singapore.

vittifrons, id. ibid., v, 1861, p. 144.
Hab. Amboina.

Genus CYLINDROTOMA.

Macquart, *S. à Buff. Dipt. Paris*, 1834, p. 107 : Limnobia, pt. (auctor.)

albitarsis, Doleschall, *Naturk. Tijdschr. Nederl. Indie* xiv, *Batavia*, 1857, p. 391.
Hab. Java.

Genus PŒCILOSTOLA.

Loew, *Wien. Entom. Monatschr.*, vii, 1863, p. 222.

pallens, V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 13.
Hab. Java.

Genus TANYDERUS.

Philippi, *Verh. K. K. Z. B. Gesellsch. Wien*, 1865, p. 780.

ornatissimus, Ost.-Sacken, *Berlin. Ent. Zeitschr.* xxxi, 1887, p. 228 : Cylindrotoma id., Doleschall, *Natuur. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 80.
Hab. Amboina.

Genus MEGISTOCERA.

Wiedem., *Auss. Europ. Zweifl. Ins.* i, *Hamm*, 1828, p. 55 : Nematocera, *olim* Wiedem., *Dipt. Exot.* i, 1821, p. 29 : Macquart, Schiner, Ost.-Sacken, etc.

fuscana, Wiedem. *loc. cit.* p. 55 : Nematocera, id., Wiedem., *Dipt. Exot.* i, 1821.
Hab. Java.

verticalis, id. ibid., p. 56.
Hab. Java

atra, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 80.
Hab. Amboina.

Genus TRICHOCERA.

Meigen, *Illig. Magaz.* ii, 1803, p. 262 : Tipula, pt. (auctor.) : Limonia, Latr., Macq., Walker, Schiner, Rondani, Ost.-Sacken, etc.

ocellata, Walker, *Ins. Saunders. Dipt. London*, 1856, p. 433.
Hab. India.

Genus DICRANOMYIA.

Stephens *Catal. Brit. Ins.* 1829.

saltens, Ost.-Sacken, *Berlin. Ent. Zeitschr.* xxxi, 1887, p. 172: Limnobia id. *Doleschall, Naturk. Tijdschr. Nederl. Indie*, xiv, *Batavia*, 1857, p. 390.
Hab. Java.

Genus LIBNOTES.

Westwood, *Trans. Ent. Soc. London*, 1876, p. 505.

thwaitesiana, Westw. *loc. cit.* p. 505.
Hab. Ceylon.

Genus MONGOMA.

Westwood, *Trans. Ent. Soc. London*, 1881, p. 364.

simplex, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 402.
Hab. Ternate.

pœciloptera, id. ibid , p. 403.
Hab. Sumatra.

aurantiaca, id. *Berlin. Ent. Zeitschr.* xxxi, 1887, p. 181: Limnobia id. Doleschall, *Naturk. Tijdschr. Nederl. Indie, Batavia*, xvii, 1859, p. 78.
Hab. Java.

Genus TEUCHOLABIS.

Osten-Sacken, *Proceed. Acad. Nat. Sci. Philadelphia*, 1859, p. 222.

bicolor, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 404.
Hab. Sumatra.

fenestrata, id. *Berlin. Ent. Zeitschr.* xxxi, 1887, p. 188.
Hab. Ceylon.

determinata, id. ibid., p. 188.
Hab. Sula.

Family MYCETOPHILIDI.

J. Bigot, *adhuc ined.* 1891: Mycetophilidæ, Schiner, *Faun. Austr. Dipt.* ii, *Wien*, 1864, p. 416: Mycetophilides, Westwood, *Introd. Modern Class. Ins.* 1840: Tipul. Fungicolæ, Latr.: Tipul. Fungivoræ, Meigen.

Genus MYCETOPHILA.

Meigen, *Illig. Magaz.* ii, 1803, p. 263: Sciara pt. Fabr.

bimaculata, Walker, *List Dipt. Ins. Brit. Museum*, i, *London*, 1848, p. 100.
Hab. India.

pennipes, Osten-Sacken, *Berlin. Entom. Zeitschr.* xxxi, 1887, p. 204.
Hab. Borneo.

Genus PLATYURA.

Meigen, *Illig. Magaz.* ii, 1803, p. 264: Sciophila, pt. Meigen: Sciara, pt. Fabr.: Ceroplatus, pt. Fabr., Latr.: Asindulum, pt. Latr.

aenusta, Walker, *Ins. Saunders. Dipt.* i, *London*, 1856, p. 421.
Hab. India.

Genus GLAPHYROPTERA.

Winnertz, *Verhandl. K. K. z. b. Gesellsch. Wien*, xiii, 1863, p. 781: Leia pt.

winthemi, Lehmann, V. der Wulp, *Reisen in Midden Sumatra* iv, *Natuurlijke Histoire, Diptera*, p. 7.
Hab. Sumatra. Borneo?

Genus SCIOPHILA.

Meigen, *Syst. Beschr.* i, 1818, p. 245: Platyura, pt. Fabr., Meig.: Asindulum, pt. Latr.

tropica, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xiv, *Batavia*, 1857, p. 392.
Hab. Java.

Genus SCIARA.

Meigen, *Illig. Magaz.* ii, 1803, p. 263: Tipula, pt. Linn., Fabr.: Hirtea, Fabr.: Molobrus, Latr.: Planetes, pt. Walker: Planetella, pt. Westwood.

femoralis, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 78.
Hab. Amboina.

indica, Walker, *Ins. Saunders. Dipt.* i, *London*, 1856, p. 418.
Hab. India.

laticornis, id. *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 105.
Hab. Borneo.

solita, id. ibid., p. 105.
Hab. Borneo.

rufithorax, V. der Wulp, *Reisen in Midden Sumatra*, iv, *Natuurlijke Histoire, Diptera*, p. 7.
Hab. Sumatra.

thomæ, id. ibid., p. 7.
Hab. Sumatra.

sulcata, id. *Tijdschr. Entom.* xxx, 1886-87, p. 177.
Hab. Java.

Family RHYPHIDI.

J. Bigot, *adhuc ined.* 1891 : Rhyphidæ Schiner, *Faun. Austr. Flieg.* ii, *Wien.*, 1864, p. xxiv.

Genus RHYPHUS.

Latr. *Diction.* iv, 1804 : Tipula pt. Scopoli : Sciara, Rhagio, pt. Fabr. : Anisopus (*olim*) Meigen.

maculipennis. V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 14.
Hab. Java.

Family BIBIONIDI.

J. Bigot, *adhuc. ined.* 1891 : Bibionidæ, Schiner, *Faun. Austr. Flieg.*, 1864, p. xvi : Bibionides, Westwood, *Introd. Mod. Class. Ins.* 1840 : Tipulariæ florales, Latr. : Tip. Muscæformes et Latipennes Meig.

Genus SCATHOPSE.

Geoffroy, *Hist. d. Ins.* ii, 1764, p. 545 : Tipula pt. Linn., De Geer, Fabr. : Hirtea pt. Fabr. (Meig. *olim*) : Ceria, Scopoli : Aspistes, Rath. pt.

pusilla, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, x, *Batavia*, 1859, p. 407.
Hab. Java.

Genus PLECIA.

Wiedem., *Auss. Europ. Zweifl. Ins.*, i, *Hamm.* 1828, p. 72 : Crapitula, pt. Gimmerth. *Bull. Moscou*, 1845 : Penthetria, pt. Meig. *Illig. Magaz.* ii, 1803, p. 264.

melanaspis, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 307 : Penthetria, id. Wiedem., *Auss. Europ. Zweifl. Ins.* 1828, i, p. 72 : Penth. japonica, id. ibid., p. 618. : Plecia ignicollis, Walker, *List. Dipt. Ins. Brit. Mus. London*, 1848, p. 116.
Hab. Nepal.

fulvicollis, V. der Wulp, *Tijdschr. Entom.* xxiii, p. 156 : Hirtea id. Fabr., *Syst. Antl.* p. 53 : Plecia id., Wiedem., *Auss. Europ. Zweifl. Ins.* p. 73 : Penthethria id. Wiedem. *Dipt. Exot.* i, p. 31 : Plecia id. Macquart, *S. à Buff. Dipt.* i, p. 176 : Plecia id. Doleschall *Natuur. Tijdschr. Nederl. Indie*, x, *Batavia*, 1839, p. 407 : Plecia, id. Rondani, *Ann. Mus. Civ. Genova*, vii, p. 462 : Plecia dorsalis, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 5.
Hab. Sumatra and Malay Peninsula.

tergorata, Rondani, *Ann. Mus. Civ. Genova* vii, 1875, p. 462.
Hab. Borneo.

forcipata, Ost.-Sacken *Ann. Mus. Civ. Genova*, xvi, 1881, p. 397.
Hab. Sumatra.

subvarians, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 105.
Hab. Sarawak.

tristis, V. der Wulp, *Notes Leyden Mus.* vi, 1884, p. 251.
Hab. Java.

Genus BIBIO.

Geoffroy, *Hist. Ins.* ii, 1764, p. 571: Tipula pt. De Geer, Linn., Schin. Hirtea, pt. Fabr., Panzer., Meig., (*olim*), Zetterst., etc.

bicolor, Walker, *List. Dipt. Ins. Brit. Mus.* pt. i, *London*, 1848, p. 121.
Hab. India.

rubicundus, V. der Wulp, *Notes Leyden Mus.* vi, 1884, p. 251.
Hab. Java.

Genus SIMULIUM.

Latreille, Buffon. *Hist. Nat. Crust. et Ins.* xiv, 1805, p. 294.

indicum, Becher *Journ. Asiat. Soc. Bengal*, liii, 1884, p. 199, pl. xiv.
Hab. Assam.

Division BRACHYCERATÆ.

J. Bigot, *adhuc ined.* 1891.

Sub-division EMPODIATA.

J. Bigot, *adhuc ined.* 1891.

Family TABANIDI.

J. Bigot, *adhuc ined.* 1891: Tabanii, Latr., 1802, Meigen, Macquart, Zetterst., Loew: Tabanidæ, Leach, 1819, Schiner, 1862: Tabanides, Latr. 1829: Tabanina, Tabaninæ, Rondani, 1846: Tabanidæ, Westwood, Walker: Tabanidii, J. Bigot (*olim*): Anthracina, Rafinesque: Sclerostoma, Duméril: Tabanica, Burmeist.: Tabanites, Newman.

Genus CHRYSOPS.

Meigen, *Illig. Magaz.*, ii, 1803, p. 267: Tabanus pt.

ligatus, Walker, *List Dipt. Ins. Brit. Museum, Lond.*, i, 1848, p. 195.
Hab. Bengal.

terminalis, id. ibid., p. 195.
Hab. India.

semicirculus, id. ibid., p. 196.
Hab. India.

stimulans, id., *Ins. Saunders. Dipt. London*, i, 1856, p. 73.
Hab. India.

pellucidus, Fabr. *Syst. Antl.*, p. 113.
Hab. Tranquebar.

dispar, Fabr., *Entom. System. Suppl.*, p. 567.
Hab. India.

fasciatus, Wiedem., *Dipt. Exot.*, i, p. 103.
Hab. Java.

translucens, Macquart, *Dipt. Exot.* pt. i, 1838, p. 158.
Hab. Java.

flaviventris, id. ibid., *Suppl.* i, 1846, p. 44.
Hab. India.

rufitarsis, id. ibid., *Suppl.*, ii, 1847, p. 14.
Hab. Java.

fixissimus, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 112.
Hab. Borneo.

unizonatus, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 459.
Hab. Borneo.

albicinctus, V. der Wulp, *Tijdschr. Entom.*, xi, 1868, p. 103.
Hab. Salawatti.

striatus, id., *Notes Leyden Mus.*, vii, 1885, p. 79.
Hab. Amoy, China.

clavicrus, Thomson, *Eugenie Resa, Stockholm*, 1858-68, p. 452.
Hab. Malacca.

Genus PANGONIA.

Latr., *Hist. Nat. Crust. et Ins.*, iii, 1794, p. 437: Tanyglossa, Meigen *Klassif.* p, 174: Tabanus pt. Linn., Rossi, Fabr.: Bombylius, pt. Olivier, *Encycl. Method.*

amboinensis, Fabr., *Syst. Antl.*, p. 91.
Hab. Amboina, Himalayas.

longirostris, Walker, *List Dipt. Ins. Brit. Museum, London*, 1854. pt. v, *Suppl.* p. 139.
Hab. India.

taprobanes, id. ibid., *Addenda,* 1854, p. 324.
Hab. Ceylon.

rufa, Macquart, *Dipt. Exot. Suppl.* pt. iv, *Paris,* 1850, p. 18.
Hab. Bombay.

Genus SILVIUS.

Meigen, *Syst. Besch.* ii, 1820, p. 27, Wiedem., Macq. : Tabanus pt.

dimidiatus, V. der Wulp, *Tijdschr. Entom.,* xi, 1868, p. 102.
Hab. Salawatti.

Genus HÆMATOPOTA.

Meigen, *Illig. Magaz.* ii, 1803, p. 267 : Tabanus pt.

cana, Walker, *List Dipt. Ins. Brit. Mus. London,* pt. i, 1848, p. 207.
Hab. Bengal.

atomaria, id. *Journ. Proceed. Linn. Soc. London,* i, 1857, p. 112.
Hab. Borneo.

irrorata, Macquart, *Dipt. Exot.* pt. i, 1838, p. 163.
Hab. Java.

lunulata, id. ibid., *Suppl.* ii, *Suites,* 1847, p. 15.
Hab. Java.

roralis, Fabr. *Syst. Antl.,* p. 107.
Hab. Tranquebar, Madras Pr.

javana, Wiedem. *Ausser. Europ. Zweifl. Ins.* i, *Hamm,* 1828, p. 218.
Hab. Java.

cingulata, id. ibid., p. 216.
Hab. Java.

borneana, Rondani, *Ann. Mus. Civ. Genova,* vii, 1875, p. 461.
Hab. Borneo.

pungens, Doleschall, *Natuur. Tijdschr. Nederl. Indie,* x, *Batavia,* 1856, p. 407.
Hab. Java.

cilipes, J. Bigot, *Nouv. Archives Mus. Paris,* (3) ii, 1890, p. 205.
Hab. Laos.

pachycera, id. ibid , p. 206.
Hab. Laos.

macrocera, id. ibid., p. 207.
Hab. Laos.

Genus RHINOMYZA.

Wiedemann, *Nov. Dipt. Gener.*, 1820, p. 8.

fusca, Wiedem. ibid. p. 8.
Hab. Java.

Genus DITYLOMYIA.

J. Bigot, *Rev. et Mag. Zool. Guérin*, (2) xi, 1859, p. 305.

ornata, J. Bigot, ibid. p. 306.
Hab. Ceylon.

Genus TABANUS.

Linn., *Faun. Suec.* ii, 1761, p. 462, et auct.: Therioplectes pt. Zeller, *Isis* Agelanius, pt. Rondani, 1863: Atylotus, pt. Ost.-Sacken, 1876.

auricinctus, Macquart, *Dipt. Exot.* pt. i, *Paris*, 1838, p. 130.
Hab. Indian Archipelago.

pusillus, id. ibid., p. 127.
Hab. China.

albilateralis, id. ibid., p. 129.
Hab. Java.

cœrulescens, id. ibid., p. 128.
Hab. Java.

basalis, id. ibid., p. 126.
Hab. India.

brunneus, id., *S. à Buff. Dipt.* i, *Paris*, 1834, p. 203.
Hab. Java.

sumatrensis, id. ibid., p. 201.
Hab. Sumatra.

consanguineus, id., *Dipt. Exot.* pt. i, 1838, p. 127.
Hab. Malabar.

servillei, id. ibid., p. 128.
Hab. India.

rubicundus, id. ibid., *Supplem.*, 1846, p. 32.
Hab. India.

dorsolinea, Wiedem., *Analect. Entomol.* p. 22: T. striatus ? Fabr.
Hab. India.

virgo, id. ibid., p. 22.
Hab. India.

orientalis, id. ibid., p. 21.
Hab. India.

rubidus, id., *Dipt. Exot.*, i, p. 69.
Hab. Bengal.

ardens, id. ibid., p. 78.
Hab. Java

immanis, id. *Ausser Europ. Zweifl. Ins.*, i, *Hamm*, 1828, p. 123.
Hab. Java.

hybridus, id. ibid., p. 557.
Hab. Macao, China.

striatus, Fabr., *Entom. System.*, iv, p. 371: T. dorsolinea? Wiedem.
Hab. China; Java.

rufiventris, id. ibid., p. 96.
Hab. India.

javanus, id. *Syst. Antl.*, p. 103.
Hab. Java.

tenebrosus, Walker, *List Dipt. Ins. Brit. Mus. London*, v, *Suppl.* p. 242.
Hab. Malabar.

pyrausta, id., *Zoologist*, vii, 1849, *Append.* p. lxv.
Hab. Java.

vagus, id. ibid., *Append.* p. lxviii.
Hab. Hong-Kong.

megalops, id. *List Dipt. Ins. Brit. Mus. London*, v, *Suppl.* i, 1854, p. 247.
Hab. Java.

aurotestaceus, id. ibid., p. 247.
Hab. Shanghai.

orientis, id., *List Dipt. Ins. Brit. Mus.*, pt. i, 1848, p. 152, and v, *Suppl.* i, 1854 *Addenda*, p. 328.
Hab. Sikkim and Nepal.

explicatus. id., ibid. v, *Suppl.* i. 1854 *Addenda*, p. 328.
Hab. Sikkim.

univentris, id. ibid., i, 1848, p. 151.
Hab. Borneo.

auriflamma, id. ibid., p. 155.
Hab. Silhet, Assam.

inscitus, id. ibid., p. 161.
Hab. Silhet, Assam.

mentitus, id. ibid., p. 162.
Hab. China.

sinicus, id. ibid., p. 163.
Hab. Hong-Kong.

amœnus, id. ibid., p. 163.
Hab. Hong-Kong.

internus, id. ibid., p. 164.
Hab. Silhet.

jucundus, id. ibid., p. 187.
Hab. Hong-Kong.

albulus, id. *Ins. Saunders. Dipt.* i, *London*, 1856, p. 46.
Hab. India.

pyrrhus, id. ibid., p. 47.
Hab. India.

albimedius, id. ibid., p. 48.
Hab. India.

tenens, id. ibid., p. 49.
Hab. India.

hilaris, id. ibid., p. 49.
Hab. India.

crassus, id. ibid., p. 50.
Hab. India.

vagus, id. ibid., p. 50.
Hab. India, Java.

rubiginosus, id. ibid., p. 51.
Hab India.

umbrosus, id. ibid., p. 52.
Hab. India.

hirtus, id. ibid., p. 52.
Hab. India.

puella, id. ibid., p. 53.
Hab. India.

sanguineus, id. ibid., p. 54.
Hab. Java.

obconicus, id. ibid., p. 54.
Hab. India.

consocius, id. ibid., p. 56.
Hab. India.

perlinea, id. ibid., p. 56.
Hab. India.

nigropictus, Macquart, *Dipt. Exot. Suppl.*, v, Paris, 1855, p. 24.
Hab. India.

yao, id. ibid., p. 24.
Hab. North China.

clausicella, (*Bellardia*, Rondani), id. ibid., p. 25.
Hab. China.

confucius, id. ibid., p. 26.
Hab. China.

hoang, id. ibid., p. 27.
Hab. China.

bubali, Doleschall, *Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 407.
Hab. Java.

monoculus, id. ibid., xvii, 1858, p. 85.
Hab. Java.

cinnamomeus, id. ibid., xvii, 1858, p. 84.
Hab. Amboina.

furunculigenus, id. ibid., xvii, 1858, p. 84.
Hab. Amboina.

abscondens, Walker, *Trans. Ent. Soc. London*, v, 1860, p. 275.
Hab. Burmah.

univentris, (*nomen bis lectum*) id. ibid., i, 1857, p. 9.
Hab. Mt. Ophir ; Borneo.

partitus, id. ibid., i, 1857, p. 9.
Hab. Singapore.

nexus, id. ibid., i, 1857, p. 110.
Hab. Borneo.

fumifer, id. ibid., i, 1857, p. 110.
Hab. Borneo.

optatus, id. ibid., i, 1857, p. 111.
Hab. Borneo.

simplicissimus, id. ibid., i, 1857, p. 111.
Hab. Borneo.

serus, id. ibid., vi, 1862, p. 20.
Hab. Ceram.

justorius, Rondani, *Ann. Mus. Civ. Genova*, 1875, p. 455.
Hab. Sarawak.

alboscutatus, id. ibid., p. 456.
Hab. Sarawak.

pauper, id. ibid., p. 456.
Hab. Sarawak.

ignobilis, id. ibid., p. 457.
Hab. Sarawak.

dives, id. ibid., p. 457.
Hab. Sarawak.

fulvissimus, id. ibid., p. 458.
Hab. Sarawak.

variegatus, id. ibid., p. 458.
Hab. Sarawak.

apicalis, id. ibid., p. 459.
Hab. Sarawak.

geniculatus, V. der Wulp, *Midden Sumatra*, iv, *Natuurlijke Histoire, Diptera*, p. 16.
Hab. Sumatra.

incultus, id. ibid., p. 17.
Hab. Sumatra.

tristis, id. ibid., p. 17.
Hab. Sumatra.

fumipennis, id. ibid., p. 18.
Hab. Sumatra.

minimus, id. ibid., p. 18.
Hab. Sumatra.

equestris, id., *Notes Leyden Mus.*, vii, 1885, p. 77.
Hab. Sumatra, Java and Borneo.

felderi, id. ibid., p. 78.
Hab. Ning-po, China.

bucolicus, Schiner, *Novara Reise*, 1868, p. 81.
Hab. Hong-Kong.

nicobarensis, id. ibid., p. 81.
Hab. Nicobar Islands.

mandarinus, id. ibid., p. 83.
Hab. Hong-Kong.

administrans, id. ibid., p. 83.
Hab. Hong-Kong.

ceylanicus, id. ibid., p. 93.
Hab. Ceylon.

leucosparsus, J. Bigot *N. Archives Mus. Paris*, (3) ii, 1890, p. 203.
Hab. Laos.

nigrotectus, (*Bellardia*, Rondani), id. ibid., p. 204.
Hab. Laos.

melanognathus, (*Atylotus*, Ost.-Sacken), id. ibid., p. 204.
Hab Laos.

laotianus, (*Atylotus*, Ost.-Sacken), id. ibid., p. 205.
Hab. Laos.

Family STRATIOMYDI.

J. Bigot, *adhuc ined.*, 1891 : Stratiomydæ, Latr. 1802 : Xylophagei, Fall. 1810 : Notachanta, Latr. 1817 : id. Macquart, 1834 : Notachanten, Brauer 1882 : Stratiomydæ, Leach, 1819 : id. Rondani, 1856 : Stratiomydinæ, Rondani, 1856 : Stratiomydes Latr. 1802 : Xylophagi, Meigen, 1820 : Xylophagidæ Steph., 1829 : id. Rondani, 1856 : id. Bigot. : Xylophagina, Rondani, 1836 : Xylophagi, Walker, 1848 : Beridæ, Westwood, 1840 : Beridina, Rondani, 1836 : Cœnomydæ, Westwood, 1840 : Cenomyna, Rondani, 1836 : Sicarii, Latr., 1825 : id. Macq. 1834 : Polychœta, Zetterstedt.

Genus XYLOPHAGUS.

Meigen, *Illig. Magaz*, ii, 1803, p. 266.

brunneus, Wiedem., *Auss. Europ. Zweifl. Ins.* pt. iv, *Hamm*, 1828, p. 85.
Hab. India.

Genus ANTIDOXION.

Sneller V. Vollenhoven, *Versl. en Med. K. Akad. Wetensch.* xv, 1863.

flavicorne, id. ibid.
Hab. Java.

Genus ACRASPIDEA.

Schiner *in lit.*, V. Brauer *Zweifl. K. Mus. Wien.*, 1882, p. 75-19.

felderi, id. ibid., p. 76-20.
Hab. Ceylon.

Genus SUBULA.

Meigen, *Syst. Beschr.* ii, 1820, p. 15 : Xylophagus, pt.

calopodata, J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 195.
Hab. Ternate.

flavipes, Doleschall, *Natuur. Tijdschr. Nederl. Indie*, xvii, 1858, p. 85.
Hab. Amboina.

vittata, id. ibid., p. 86.
Hab. Amboina.

inamœna, (*Solva*) Walker, *Journ. Proceed. Linn. Soc. London* iv, 1860, p. 98 : Ost.-Sacken, *Ann. Mus. Genova*, xvi, p. 407.
Hab. Java ; Celebes.

Genus THYLACOSOMA.

Schiner *in lit.*, V. Brauer, *Zweiflug. K. Mus. Wien.*, 1882, p. 77 : ? Ruba, pt. Walker,

amboinense, Schiner *in lit.*, V. Brauer, *loc. cit.*, p. 77.
Hab. Amboina.

Genus ENGONIA.

Schiner, *in lit.*, V. Brauer, *Zweifl. Mus. Wien*, 1882, p. 76 : Negritomyia ? J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1877, *Bulletin*, p. lxxiv.

aurata, Schiner, *in lit.*, v. Brauer, *loc. cit.*, p. 76.
Hab. Amboina.

Genus NEGRITOMYIA.

J. Bigot, *Ann. Soc. Ent. France*, 1877, *Bulletin*, p. lxxiv.

bilineata, (*Stratiomys*) Fabr. *Syst. Antl.* p. 79 : V. der Wulp, *Notes Leyd. Mus.* vii. p. 59.
Hab. Java.

Genus CLITELLARIA.

Meigen, *Illig. Magaz.*, ii, 1803, p. 265 : Ephippium, Latr., 1802 : Rhaphiocera pt. Macq. : Stratiomys, pt. Fabr. *Syst. Antl.*

heminopla, Wiedem., *Auss. Europ. Zweifl. Ins.* ii, *Hamm*, 1830, p. 48 : id., *Zool. Mag.* iii, p. 30.
Hab. Tranquebar, Madras Pr.

varia, Walker, *List Dipt. Ins. Brit. Mus.*, pt. v, Suppl. i, *London*, 1854, p. 63.
Hab. Java.

angusta, id. *loc cit.*, p. 62 : Ephippium id., Macq. *S. à Buff. Dipt.* i, 1834, p. 252.
Hab. Java.

tenebrica, id., *loc. cit.*, iii, 1849, p. 522.
Hab. Java.

notabilis, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 108.
Hab. Borneo.

bivittata, Wiedem., *Auss. Europ. Zweifl. Ins.*, ii, *Hamm*, 1830, p. 46 : Stratiomys bilineata, Fabr. *Syst. Antl.* : Ephippium spinigerum ? Dolesch. : Rhaphiocera spinithorax Macq. *Dipt. Ex.*
Hab. Java.

spinigerum, (*Ephippium*) Doleschall, *Natuur. Tijdschr. Nederl. Indie.*, x, 1856, p. 407 : Engonia, id. Schin., Brauer.
Hab. Java.

nigerrimum, (*Ephippium*) Doleschall, *loc. cit.*, xvii, 1858, p. 81.
Hab. Java.

flaviceps, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 7.
Hab. Singapore.

Genus BERIS.

Latr. *Hist. Nat. Crust. et Ins.* iii, 1802, p. 340 : Stratiomys, pt. Fabr., Fall. : Actina, pt. Meig.

javana, Macquart, *Dipt. Exot.* i, pt. ii, Paris, 1838, p. 188.
Hab. Java.

Genus CULCUA.

Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 109.

simulans, Walker, ibid., p. 109.
Hab. Borneo, Malacca.

Genus CYCLOGASTER.

Macquart, *S. à Buff. Dipt.* i, *Paris*, 1834, p. 256.

radians, Walker, *Journ. Proceed. Linn., Soc. London*, i, 1857, p. 7.
Hab. Singapore.

Genus HERMETIA.

Latr. *Dict. Hist. Nat.* xxiv, p. 192, Fabr., Wied., Macq. : Nemotelus, pt. Degeer. : Bibio, Syrphus, Mydas, pt. auctor. : Xylophagus, pt. Lamarck.

melanæsiæ, Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 202 : H. batjanensis, V. der Wulp, *Tijdschr. Entom.*, xxiii, p. 161 : Massicyta cerioides Walker. ?
Hab. Indian Archipelago.

rufiventris, (*Nomen bislectum*) Walker, *Journ. Proceed. Linn. Soc. London*, v, 1861, p. 145.
Hab. Amboina.

Genus PHYLLOPHORA.

Macquart, *Dipt. Exot.* i, pt. i, *Paris*, 1838, p. 178.

angusta, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 7.
Hab. Singapore.

Genus TINDA.

Walker, *Journ. Proceed. Linn. Soc. London*, iv, 1860, p. 101.

indica, V. der Wulp, *Notes Leyd. Mus.*, vii, 1885, p. 57 : Biartes id. Walker, *Ins. Saunders. Dipt.*, i, *London*, 1856, p. 87 : Tinda modifera, Walker, *Journ. Proceed. Linn. Soc. London*, iv, 1860, p. 101 : Phyllophora bispinosa, Thomson, *Eugenie Resa*, p. 454.
Hab. Java, Manilla.

Genus EVAZA.

Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 109.

bipars, Walker, ibid., p. 110.
Hab. Borneo.

flavipes, J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 219.
Hab. India.

argyroceps, id. ibid., p. 219.
Hab. The Moluccas.

fulviventris, id. ibid., p. 220.
Hab. The Moluccas.

Genus NERNA.

(*nec Nerua*) Walker, *Journ. Proceed. Linn. Soc. London*, iii, 1859, p. 81.

mollis, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 415.
Hab. Sumatra.

Genus PTILOCERA.

Wiedem., *Auss. Europ. Zweifl. Ins.* ii, *Hamm*, 1830, p. 58 : Stratiomys, pt.

quadridentata, Wiedem., *loc. cit.*, p. 59.
Hab. Java.

continua, Walker, *Ins. Saunders. Dipt. London*, 1856, pt. i, p. 84.
Hab. Java.

smaragdina, Snellen v. Vollenhoven, *Mem. Entomol. Pays-Bas*, i, 1858, p. 92.
Hab. Celebes.
amethystina, id. ibid., p. 92.
Hab. Amboina, Java and Celebes.

fastuosa, Gerstaecker, *Linn. Ent.* xi, 1857, p. 333.
Hab. Ceylon.

Genus WALLACEA.

Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 82.

argentea, Doleschall, *loc. cit.*, p. 82.
Hab. Amboina.

Genus ACRASPIDEA.

Brauer, *Zweifl. Kais. Mus. Wien*, 1882, p. 19.

felderi, Brauer, *loc. cit.*, p. 20.
Hab. Ceylon.

Genus ACANTHINA.

Wiedem., *Auss. Europ. Zweifl. Ins.* ii, *Hamm*, 1830, p. 50.

azurea, Gerstaecker, *Linn. Ent.*, xi, 1857, p. 335.
Hab. Ceylon.

Genus ELASMA.

Jaennicke, *Neu. Exot. Dipter. Frankfurt*, 1867, p. 14.

acanthinoidea, Jaennicke, *loc. cit.*, p. 15.
Hab. Java.

Genus PACHYGASTER.

Meigen, *Illig. Magaz.*, ii, 1803, p. 266: Nemotelus, pt. Panzer: Sargus, pt. Fall.: Vappo, pt. Latr.

rufitarsis, Macquart, *Dipt. Exot. Paris, Suppl.* 1846, p. 57.
Hab. Pondicherry.

Genus TOXOCERA.

Macquart, *Dipt. Exot. Suppl.* iv, *Paris*, 1850, p. 44.

limbiventris, Macq., *loc. cit.*, p. 45.
Hab. Java.

Genus MASSICYTA.

Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 8.

bicolor, Walker, *loc. cit.*, p. 8.
Hab. Singapore.

Genus RHACHICERUS.

Haliday, *List Dipt. Ins.* 1848, p. 154.

zonotus, Ost. Sacken, *Ann. Mus. Genova*, xvi 1881, p. 408.
Hab. Sumatra.

Genus STRATIOMYS.

Geoffr. *Hist. Nat. Ins.* ii, 1764: Hirtea, pt. Scopoli: Hoplomyia, Zeller, Loew.

barca, Walker, *List Dipt. Ins. Brit. Museum, London,* 1849, p. 530.
Hab. China.

garatas, id. ibid., p. 532.
Hab. China.

apicalis, id. ibid., Part v, 1854, p. 53.
Hab. North China.

lutatius, id. ibid., 1849, p. 532.
Hab. Malacca.

solennis, id., *Ins. Saunders. Diptor. London,* i, 1856, p. 79.
Hab. India.

inanimis, id., *Trans., Ent. Soc. London,* iv, 1857, p. 121.
Hab. China.

viridana, Wiedem., *Auss. Europ. Zweifl. Ins.,* ii, *Hamm,* 1830, p. 66.
Hab. Bengal.

minuta, Fabr., *Entom. System.,* iv, p. 268.
Hab. Tranquebar, Madras Pr.

pusilla, id. ibid., p. 271
Hab. Tranquebar, Madras Pr.

rufipennis, Macquart, *Dipt. Exot. Suppl.* v. *Paris,* 1855, p. 42.
Hab. South China.

flavoscutellata, V. der Wulp, *Notes Leyd. Mus.* vii, 1885, p. 60.
Hab. Java.

Genus ODONTOMYIA.

Meigen, *Klassific.* i, 1804, p. 123: Stratiomys, pt. apud V. der Wulp.

viridana, Wiedem., *Analect. Entom.*: Macquart *Dipt. Exot. Suppl.,* iv, 1850, p. 48.
Hab. Bengal.

consobrina, Macquart, *Dipt. Exot., Suppl.,* ii, *Paris,* 1847, p. 16.
Hab. Java.

diffusa (*Stratiomys*) Walker, *List Dipt. Ins. Brit. Mus.,* part v, *London,* 1854, p. 53.
Hab. Java.

mutica, V. der Wulp, *Notes Leyd. Mus.* vii, 1885, p. 62.
Hab Ternate.

Genus CAMPEPROSOPA.

Macquart, *Dipt. Exot. Suppl.*, iv, 1850, p. 46.

flavipes, Macquart, *loc. cit.*, p. 46.
Hab. Java.

munda, Osten-Sacken, *Ann. Mus. Civ. Genova*, 1881, p. 409.
Hab. Sumatra.

Genus CHRYSOCHLORA.

Latr. *Fam. Natuur.*, 1825, Macquart: Sargus, pt.

baccoides, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 454.
Hab. Sarawak.

vitripennis, Doleschall, *Natuur. Tijdschr. Nederl. Indie.*, x, 1856, p. 408.
Hab. Java.

Genus MICROCHRYZA.

Loew, *Verhandl. K. K. z. b. Gesellsch. Wien*, 1855, p. 146 : Sargus, pt.

gemma, J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 231.
Hab. Ceylon.

Genus TRICHOCHÆTA.

J. Bigot, *Ann. Soc. Ent. France*, (5) ix, *Bullet.* 1878 p. xxii, et errata.

nemoteloides, id. ibid., p. xxii.
Hab. Ternate.

Genus RAPHIOCERA.

Macquart, *S. à Buff. Dipt.*, i, 1834, p. 253.

spinithorax, Macquart, *Dipt. Exot. Suppl.* ii, *Paris*, 1847, p. 17: Stratiomys bilineata, Fabr.: Clitellaria bivittata Wiedem.: Ephippium spinigerum, Doleschall:
Hab. Java.

Genus PTECTICUS.

Loew, *Verhandl. K. K. z. b. Gesellsch. Wien.*, v, 1855, p. 142.

apicalis, Loew, *loc. cit.*, p. 142.
Hab. Pinang.

cingulatus, id. ibid., p. 143.
Hab. Pinang.

australis, Schiner, *Novara Reise*, 1868, p. 65.
Hab. Nicobar Islands.

illustris, id. ibid., p. 65.
Hab. Nicobar Islands.

apicalis, (*nom. bislectum*), V. der Wulp, *Notes Leyden Museum*, vii, 1885, p. 62.
Hab. Sumatra, Borneo.

brevipennis, V. der Wulp, *loc. cit.*, p. 63 : Sargus id. Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 454.
Hab. Borneo, Java.

latifascia, V. der Wulp, *loc. cit.*, p. 64 : Sargus, id. Walker *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 110.
Hab. Borneo, Java.

Genus SARGUS.

Fabr. *Entom. System. Suppl.*, 1798, p. 566 : Rhagio pt. Schranck : Nemotelus pt. Degeer.

gemmifer, Walker, *List Dipt. Ins. Brit. Mus.* iii, *London*, 1849, p. 516.
Hab. Sylhet, Assam.

tenebrifer, id. ibid., p. 517.
Hab. China.

aurifer, id. ibid., v. *Suppl.* i, *London*, 1854, p. 96.
Hab. India, China.

luridus, id. *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 8.
Hab. Singapore.

quadrifasciatus, id. ibid., v, 1861, p. 146.
Hab. Amboina.

metallinus, Fabr., *Syst. Antl.*, p. 258 : V. der Wulp, *Notes Leyd. Mus.* vii, 1885, p. 65.
Hab. Bengal ; Java.

longipennis, Wiedem., *Analect. Entomol.*, p. 31.
Hab. Java.

insignis, Macquart, *Dipt. Exot. Suppl.*, v, *Paris*, 1855, p. 16.
Hab. China.

viridiceps, id. ibid., 1856, p. 110 : Ptecticus id. V. der Wulp.
Hab. China.

pallipes, Bigot, *Ann. Soc. Ent. France*, (5) xi, 1879, p. 222.
Hab. Ceylon.

magnificus, id. ibid., p. 222.
Hab. Assam.

rufus, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 83.
Hab. Amboina.

ferrugineus, id. ibid., p. 83.
Hab. Amboina.

formicæformis, id. ibid., xiv, 1857, p. 403 : Sarg. metallinus, V. der Wulp.
Hab. Amboina.

leoninus, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 454.
Hab. Sarawak.

brevipennis, id. ibid., p. 454 : Ptecticus id., V. der Wulp.
Hab. Sarawak.

lætus, V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 66.
Hab. Sumatra.

rubescens, id. ibid., p. 67.
Hab. Gorontalo.

Genus CHRYSOMYIA.

Macquart, *S. à Buff. Dipt. Paris*, 1834, p. 262 : Sargus, pt. et Nemotelus, pt. Degeer.

flaviventris, Wiedem., *Analect. Entom.*, p. 31 : Sargus id., Macquart, *Dipt. Exot.* : Microchryza id., Ost.-Sacken, 1881.
Hab. India, Java.

affinis, id. ibid., p. 31 : Sargus id., Macquart, *Dipt. Exot.*
Hab. India.

Genus EUDMETA.

Wiedem., *Auss. Europ. Zweifl. Ins. Hamm*, 1830, p. 43 : Hermetia, pt.

marginata, Wiedem., *loc. cit.*, p. 45 : Hermetia, id. Fabr., *Syst. Antl.* p. 63 : Hermetia cingulata (vel cingulalis,) Guerin, *Icon. Regn. Anim.*, p. 543.
Hab. Amboina, Java.

Family NEMESTRINIDI.

J. Bigot, *adhuc ined.* : Nemestrinidæ, Macquart, *S. à Buff. Dipt.*, i, *Paris*, 1834, p. 370 : Anthracii et Bombyliarii, Latr. : Nemestrinidæ, Schiner *Faun. Austr., Flieg.*, i, 1862, *Wien.*, p. 44.

Genus NEMESTRINA.

Latr. *Hist. Nat. Crust. et Ins.* xiv, 1804, p. 319.

javana, Macquart *Dipt. Exot.* ii, pt., i, *Paris*, 1840, p. 17.
Hab. Java.

Genus Colax.

Wiedem., *Analecta Entomol.*, 1824.

javanus, Wiedem., *loc. cit.*, 1824, p. 18.
Hab. Java.

variegatus, Westwood, *Cabinet of Orient. Entomol., London*, p. 38.
Hab. China.

Family LEPTIDI.

J. Bigot, *adhuc ined.*: Leptides, Meigen, *Syst. Beschr.* ii, 1820: Leptidæ, Westw., *Introd. Entom.*, 1840: Schiner, *Faun. Austr. Flieg*, i, *Wien*, 1862, p. 170.

Genus Leptis.

Fabr., *Syst. Antl.*, 1806, p. 9: Nemotelus, pt. Degeer: Rhagio, pt. Latr., Olivier, Walker.

decisa, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 15.
Hab. Malacca.

uniguttata, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 422.
Hab. Sumatra.

Genus Heliomyia.

Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xiv, *Batavia*, 1857, p. 402, Chrysopyla? pt.

ferruginea, Doleschall, *loc. cit.*, p. 402.
Hab. Amboina.

Genus Atherix.

Meigen, *Illig. Magaz.*, 1803, p. 271: Rhagio pt. Fabr.: Bibio, pt. Fabr.: Leptis, pt. Fabr., Fall.: Ibisia, pt. Rondani.

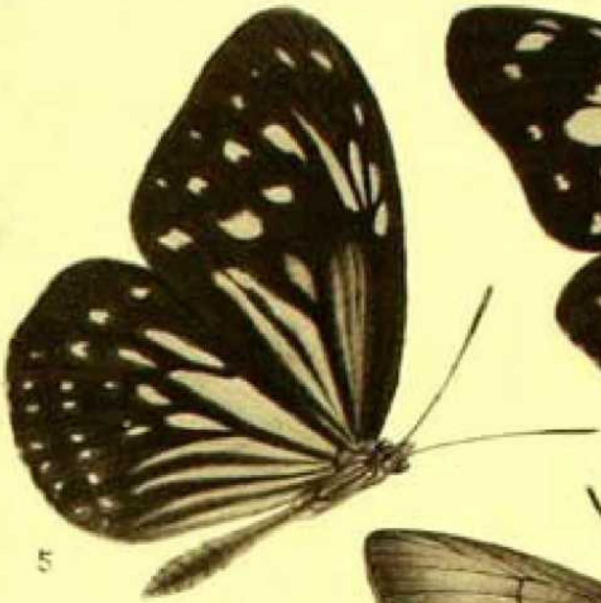
nigritarsis, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 92.
Hab. Amboina.

labiatus, Bigot, *Bull Soc. Zool. France*, xii, *Paris*, 1887, p. 21.
Hab. Ceylon.

Genus Chrysopila.

Macquart, *Dipt. Nord. France*, i, 1827: Leptis, pt. Meigen: Rhagio, pt. Latr., Walker: Atherix, pt. Fabr.

maculipennis, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 118.
Hab. Borneo.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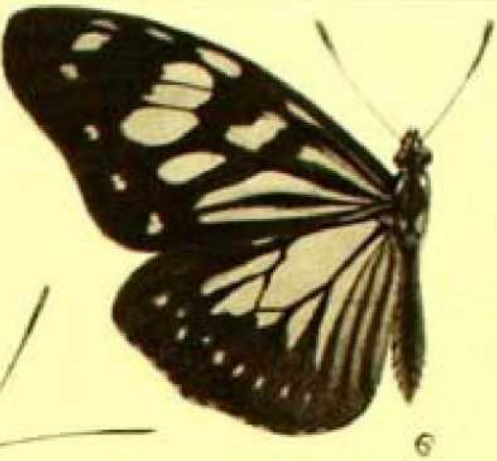
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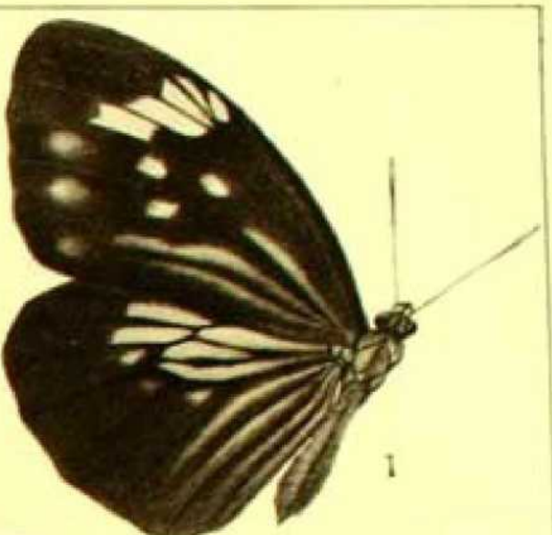
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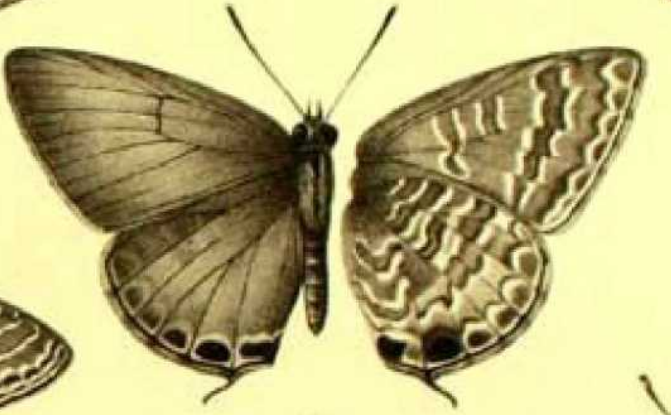
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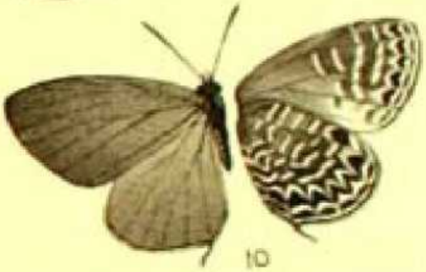
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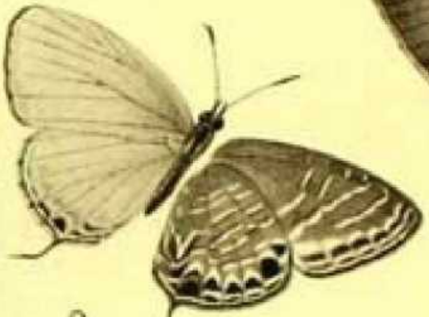
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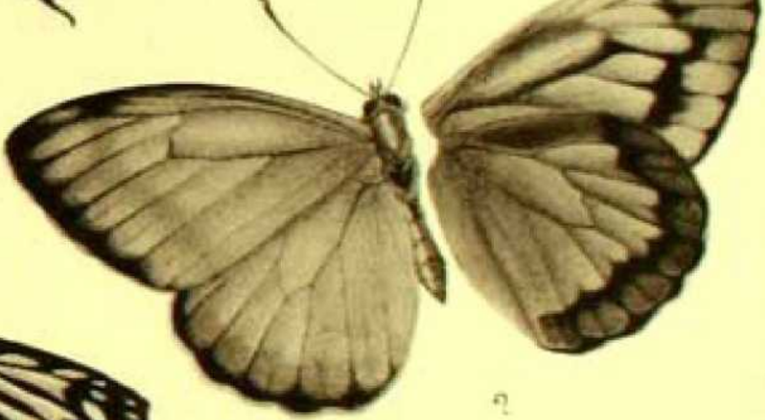
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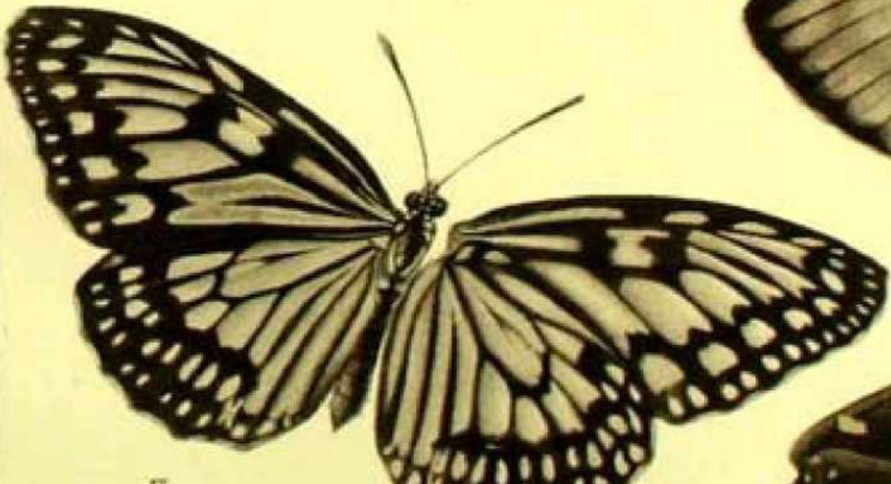
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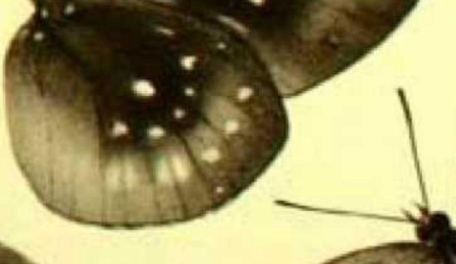
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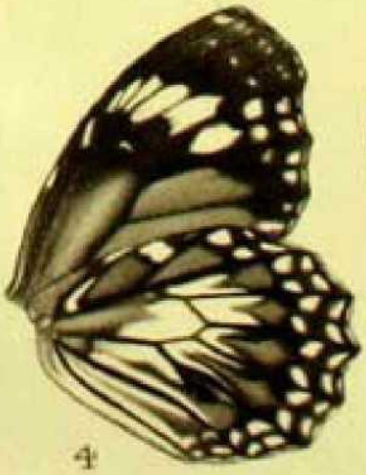
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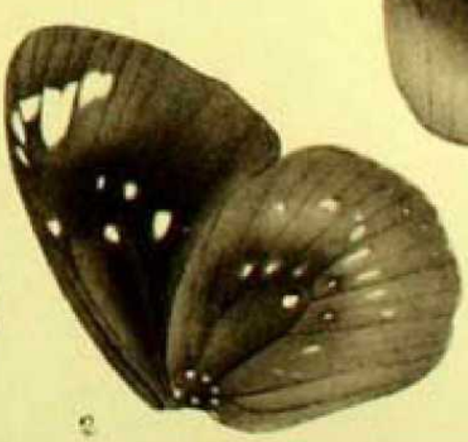
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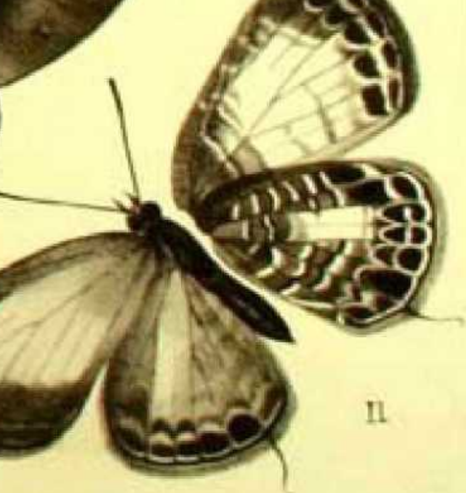
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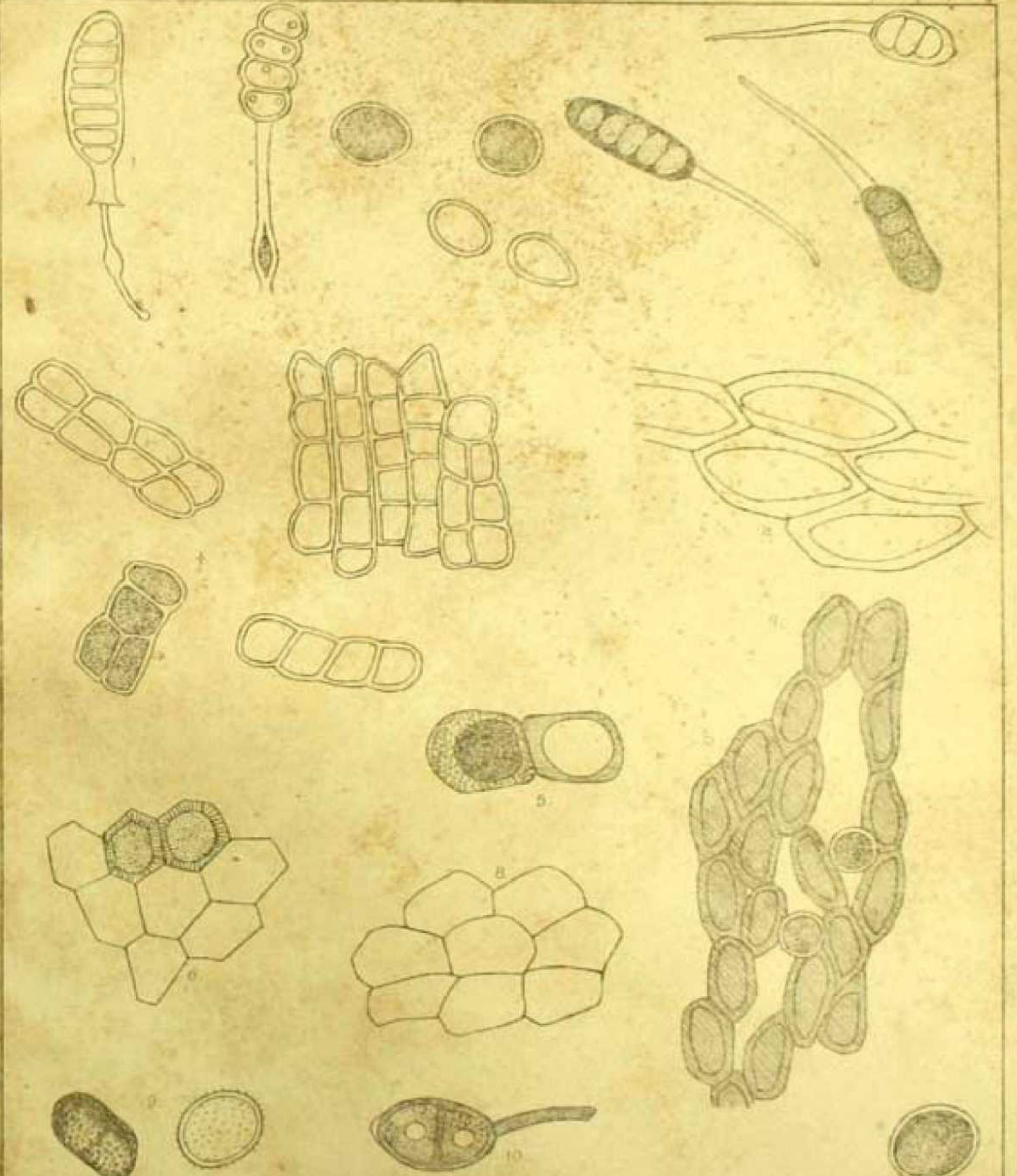

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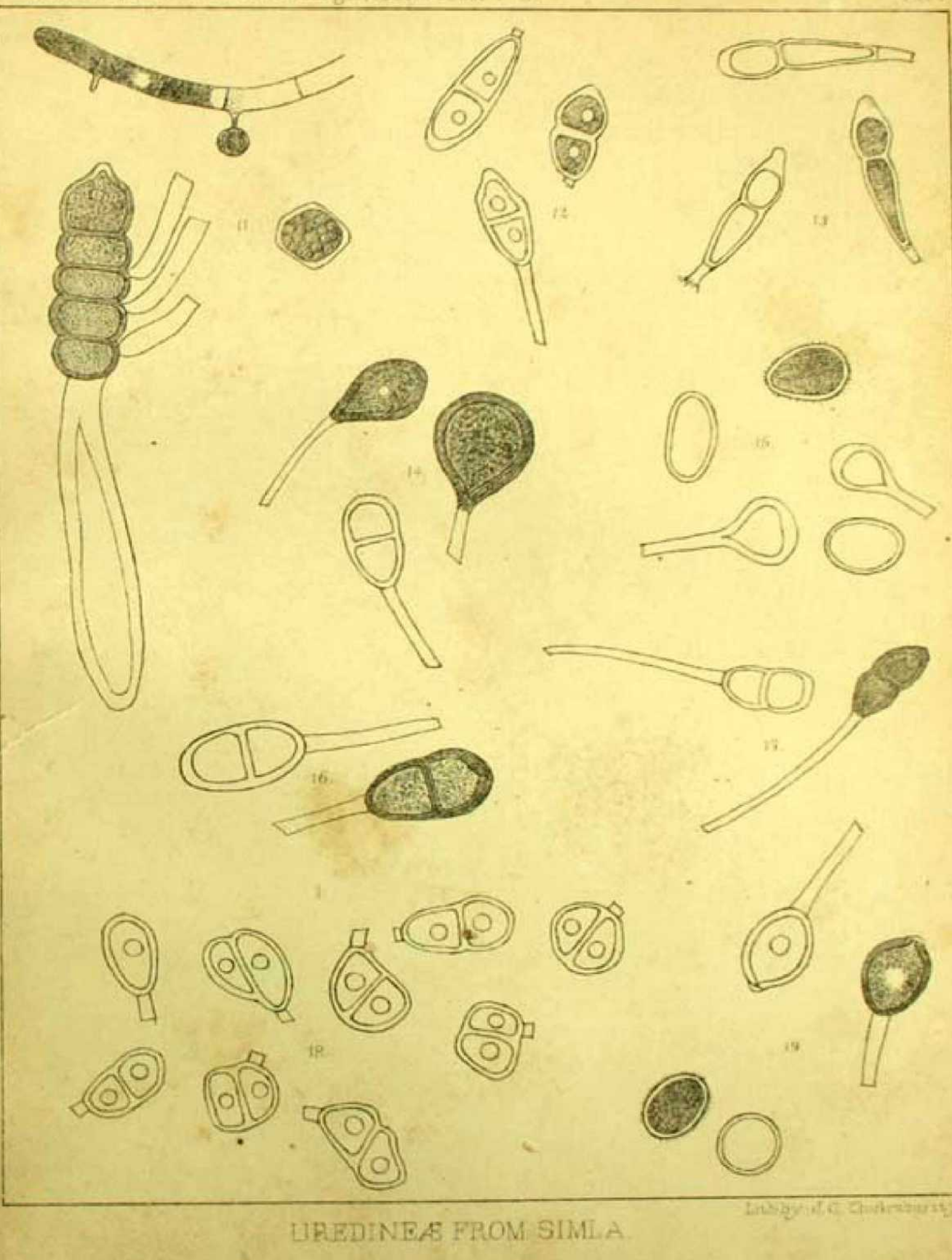

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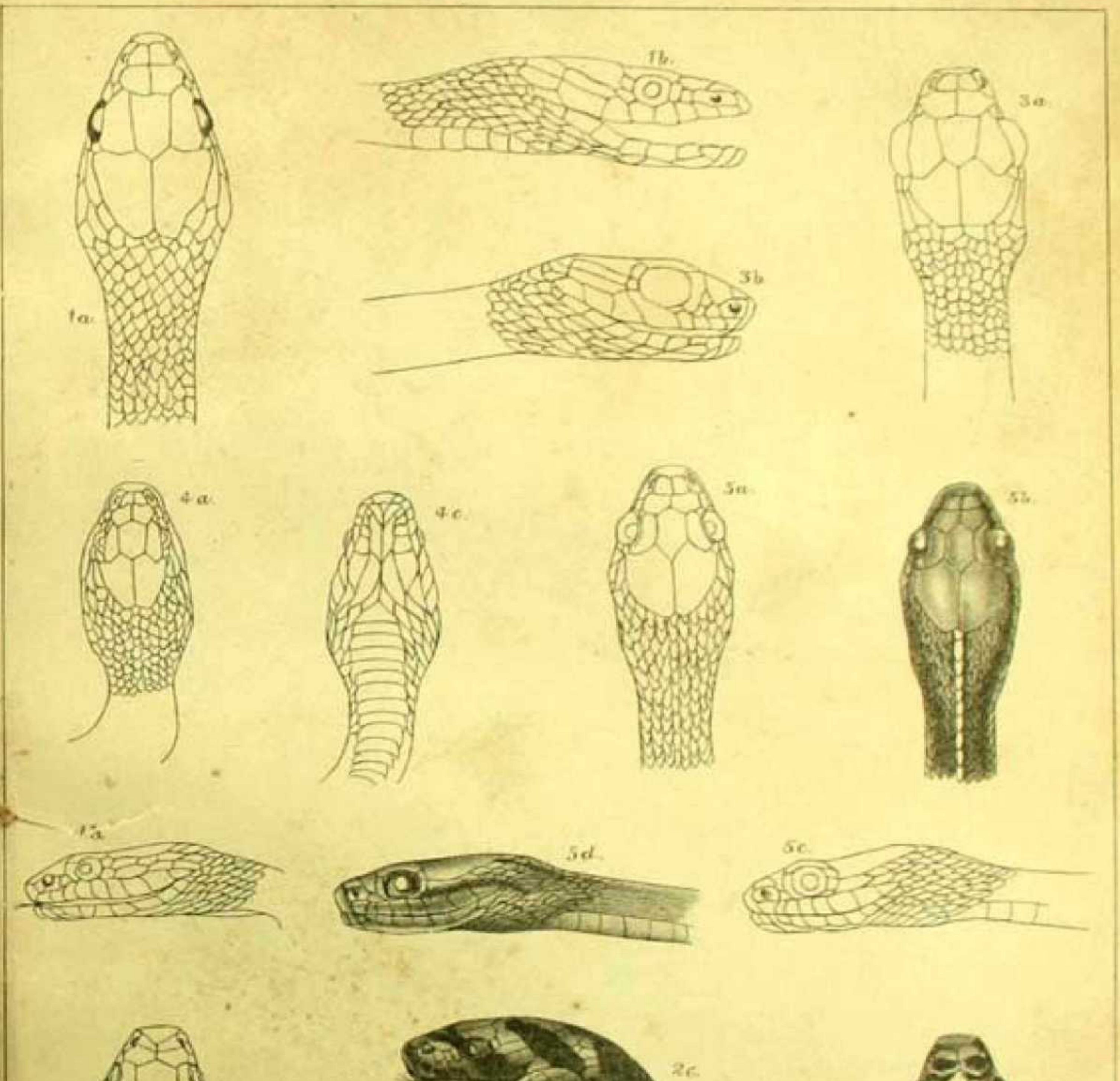

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